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STATISTICS OF WATERBORNE OUTBREAKS IN THE UNITED STATES, 1920-1980

by

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16. ABSTRACT

From 1920-1980, 1405 waterborne outbreaks, 386,144 cases of illness, and 1083 deaths were reported in the United States. This report analyzes these data and discusses the important etiologic agents and causes of these outbreaks.

17. KEY WORDS AND DOCUMENT ANALYSIS

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Statistics of Waterborne Outbreaks in the United States

1920-80

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I. INTRODUCTION

Statistical data have been collected on waterborne disease outbreaks in the United States since 1920.[1-21] During 1920 through 1936, these data were collected and compiled by Gorman and Wolman.[1,2] In subsequent periods[a], data were collected by several federal agencies, and summaries were prepared by various individuals.[3-21] The Centers for Disease Control and the Environmental Protection Agency have cooperated since 1971 in waterborne disease investigation and surveillance and have published information on waterborne outbreaks annually.[13-21] All of the available data on waterborne outbreaks have been compiled and examined to provide a historical perspective of the epidemiology of waterborne disease over the past sixty-one years. This summary is intended to supplement the reviews and analysis of waterborne outbreaks contained in the preceding reprinted articles of Groman and Wolman;[1] Eliassen and Cummings;[4] Weibal et al.;[5] Craun and McCabe;[8] and Craun et al.[11] (Chapters 4 and 5). The reporting of waterborne outbreaks has been and continues to be voluntary, and all of these data on these outbreaks have been obtained from the scientific and medical literature and from official sources through the cooperation and assistance of state and local health officials, epidemiologists, and water supply engineers. It is recognized that these data may reflect differences in the reporting and surveillance interests of the states over the past sixty-one years, but it is felt that the data are reasonably complete for the analysis of their causes and etiologies.

These data were compiled after reviewing tabulations of waterborne outbreaks from 1920 through 1945 and individual reports of waterborne outbreaks from 1946 through 1980. An attempt was made to maintain consistency in classifying etiological agents, disease, and types of water systems. Individual reports of investigations were generally unavailable to provide additional information or resolve questions regarding classifications for outbreaks prior to 1946, and the resulting tabulation (Appendix A) represents the best available information based on interpretations from footnotes contained in the tabulations and from descriptions in previous reviews.[1-4]

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[a] No data were collected in 1937.

II. DEFINITIONS

In compilations prior to 1970, water systems experiencing an outbreak were classified as either community (public) or noncommunity (private) water systems. For this summary, all water systems were reclassified as community, noncommunity, and individual according to definitions contained in the Safe Drinking Water Act (P.L. 93-523). Community systems are public or investor-owned water supplies serving large or small communities, subdivisions, and mobile-home parks of at least 25 year-round residents or 15 service connections used by year-round residents. Noncommunity systems are seasonally-operated water supplies or supplies that serve travelers and transients. These systems must serve an average of at least 25 individuals for 60 or more days during the year and include institutions, industries, camps, parks, hotels, and service stations which maintain their own water supply for employees and the traveling public. Individual systems are water supplies used by residents in areas without community systems or by persons traveling outside of populated areas (e.g., backpackers, campers).

During 1920 through 1936 the criterion of five cases of illness was used to define an outbreak, and only those waterborne outbreaks of five or more cases were included in tabulations for this period. In subsequent years two cases of illness (except for single cases of chemical poisonings) was the criterion used to define an outbreak. Gorman and Wolman[1] reported that 12 waterborne outbreaks were excluded from their analysis of data for 1920 through 1936 because fewer than five individuals were affected. It was not possible to include these 12 outbreaks in this summary, as data on the specific outbreaks were unavailable. Using the criterion of five cases of illness to define an outbreak during 1936 through 1980 would have resulted in the exclusion of 101 outbreaks, most of which were outbreaks of typhoid fever and chemical poisonings in individual water systems. Rather than lose the information from this large number of outbreaks, it was decided to include outbreaks of less than five cases during 1936 through 1980 and to note the inconsistency in the definition of an outbreak between the two time periods.

In a few instances the number of cases of illness resulting from an outbreak was reported to be unknown or many, and an estimate of the number of actual illnesses was required. When detailed descriptions, such as population at risk and attack rates of smaller populations from special surveys, were available from the outbreak investigation report, it was possible to provide a reasonable estimate of the number of illnesses which might have occurred. When no additional information was available, an estimate of two cases of illness was used even though it was felt that in almost all instances this was a large underestimate of the number of illnesses which had actually occurred. When the number of illnesses was originally reported as a range, the mean was used for this summary except where the maximum number of illnesses reported appeared to be more appropriate based on information contained in the report of the investigation or information used to prepare previous summaries. In the few instances where a single number of estimated cases was substituted for a range, comparison of outbreaks in this tabulation (Appendix A) with those of previous tabulations will show the outbreaks affected and the differences in the estimated number of illnesses used for this summary and the number used in previous summaries.

During the period 1920 through 1929, acute gastrointestinal illness, diarrhea, or dysentery were not differentiated from specific infections of amebic and bacillary dysentery (except for a single outbreak where 4 cases of bacillary dysentery were identified), and these illnesses were classified in this tabulation as acute gastroenteritis of undefined etiology. In subsequent periods, these illnesses were differentiated and are listed as such in this tabulation when a specific etiology was noted. Where no etiologic agent was specified in outbreaks of dysentery, illnesses were classified in this tabulation as acute gastroenteritis, and this resulted in the reclassification of 11 outbreaks which had previously been identified as dysentery outbreaks because of symptomatology of the illness.

III. WATERBORNE OUTBREAKS

During the sixty-one year period, 1405 waterborne outbreaks were reported in the United States, and 386,144 cases of illness and 1083 deaths were associated with these outbreaks. Each of the 50 states, the District of Columbia, and Puerto Rico reported at least one outbreak during this period. Forty-three percent of these outbreaks occurred in community water systems compared with 35 percent in noncommunity and 22 percent in individual water systems (Figure 1). The majority of illnesses (87 percent) and deaths (71 percent) occurred as the result of outbreaks in community water systems.

The number of outbreaks reported annually ranged from a minimum of six in 1957 to a maximum of 60 in 1941 with a mean of 23.4 (SD 11.96) outbreaks and a median of 22.5 outbreaks for the entire period (Figure 2). The data indicate a uniform distribution for waterborne outbreaks reported from 1920 through 1930 with an average of 23 outbreaks reported annually. Thereafter, the occurrence of waterborne outbreaks appeared to be cyclical with more than 40 outbreaks being reported annually during 1938 through 1941 and 1979 through 1980 and less than 20 outbreaks reported annually during 1950 through 1970.

During 1920 through 1936, waterborne outbreaks were reported most frequently in community water systems; afterwards outbreaks were generally reported most frequently in noncommunity water systems (Figures 3-4). In most (70 percent) of the years after 1938 more outbreaks were reported in noncommunity water systems than were reported in community water systems, and except for the years 1921 through 1929, 1941, and 1955 through 1966, more outbreaks were reported in noncommunity water systems than were reported in individual water systems. More outbreaks were reported in community water systems than were reported in individual water systems for each year except 1930, 1938, 1939, 1941, 1948, 1953, 1955, and 1957 through 1969.

In general the number of outbreaks reported in community water systems decreased during the late 1920's through the early 1930's and during the mid 1940's through the mid 1950's. Since the mid 1960's, however, the number of outbreaks reported in community water systems has increased dramatically, and the numbers reported in 1979 and in 1980 were the most reported in any year since 1942. The number of waterborne outbreaks reported in noncommunity water systems increased from 1920 through the mid 1940's and subsequently decreased until the mid 1960's when an increase was also observed. The number of waterborne outbreaks reported in individual water systems generally increased from 1920 through 1941 and subsequently decreased until the mid 1950's. An increase in reported outbreaks similar to that experienced by community and noncommunity water systems during the late 1960's through 1980 was not seen in individual water systems.

A. Reporting

The decline in the number of waterborne outbreaks which occurred from the 1940's through the late 1960's was not felt to be associated with either major new developments in water treatment technology or a more widespread application of existing treatment technology. Disinfection and filtration, which resulted in a drastic reduction in waterborne disease in the United States earlier during this century, were developed and applied to most surface water systems prior to this time.[22-26] Community water systems were developed for most major cities in the United States during the late 1800's and early 1900's, and filtration and disinfection of water to prevent waterborne disease was introduced and applied increasingly in the years prior to 1940 (Tables 1-3). Slow sand filtration of municipal drinking water was first applied in the United States in 1889 at Albany, New York, and the first mechanical or rapid sand filter built along modern lines was installed in 1893 at Lawrence, Massachusetts. By 1904, some ten perecnt of the urban population (which largely relies on surface water sources) of the United States received filtered water and by 1914 approximately 36 percent of the urban population received filtered water. Whipple[22] reported that after the filtration of water in Albany and Lawrence mortality from typhoid fever was reduced from an average of 104 cases per 100,000 population and 121 cases per

100,000 respectively to 26 cases per 100,000. In Binghamtom and Watertown, New York, the typhoid fever mortality rates fell from 49 cases per 100,000 to 11 cases per 100,000 and 97 cases per 100,000 to 27 cases per 100,000 respectively. In 1908 Whipple noted that "filtration afforts the safest protection of surface waters against waterborne diseases. This has been proved by long experience abroad, and data illustrating this truth are constantly being accumulated in this country." Whipple witnessed the period of rapid expansion of water filtration in the United States as evidenced by this passage in his book: "It is gratifying to see that so many of our American cities have awakened to the need of properly safeguarding the quality of the drinking water supplied to the public for drinking purposes. During the last five years (1903-1908), filter plants have been built and put into operation in Charleston, South Carolina, Youngstown, Ohio, Washington, D.C., Providence, Rhode Island, New Haven, Connecticut, Watertown, New York, Indianapolis, Indiana, Philadelphia, Pennsylvania, New Milford, New Jersey, Brooklyn, New York, and Binghamton, New York, Little Falls and Hackensack, New Jersey, Chester, Pennsylvania, and elsewhere. Large filters are under construction in Philadelphia, Pittsburgh, Cincinnati, Louisville, Columbus, Ohio, and New Orleans, and filter plants are being enlarged or improved in Bangor, Maine, Albany, New York, Yonkers, New York. In other cities such as Troy, New York City, Toledo, Ohio, Oakland, California, Grand Rapids, Michigan, Wilmington, Delawre, Minneapolis, Minnesota, Trenton, New Jersey, Lynn, Massachusetts, and Lancaster, Pennsylvania, they have been recommended, and the projects are under consideration." Although the number of purification (filtration) facilities increased rapidly through 1930 and continued to increase through 1958, the proportion of communities with purification facilities increased only slightly from 14 percent in 1930 to 16 percent in 1940 and decreased to

12 percent in 1948 and 1958. The urban population receiving filtered water increased rapidly through 1914 but has increased only moderately since then. In 1914, 36 percent of the urban population received filtered water; in 1940, 41 percent received filtered water, and in 1958, 48 perecnt received filtered water.

The first continuous application of chlorine to disinfect a municipal water supply in the United States occurred in 1908 when sodium hypochlorite was used to disinfect the Boonton reservoir of Jersy City, New Jersey. The early acceptance of chlorination as a public health safeguard and the development in 1912 of commercial equipment to apply gaseous chlorine to water supplies paved the way for the rapid expansion of chlorine disinfection through the 1930's. Approximately 2900 community water facilities disinfected drinking water prior to 1930, and although this increased to some 4600 facilities in 1940 and 6137 in 1948, only a moderate increase occurred in the percentage of community water facilities with disinfection capabilities. In 1930, 27 percent of the community water systems had disinfection facilities; in 1940, 31 percent had disinfection, and in 1948, 37 percent had disinfection. This moderate increase in the percentage of water systems with disinfection and the accompanying increase in the population served by filtered or disinfected water (from 67 percent in 1940 to 83 percent in 1948) is not felt to offer sufficient evidence that improved treatment of water supplies was a major reason for the dramatic decrease in the number of reported waterborne outbreaks from 1940 to 1950.

The increased number of waterborne outbreaks observed in the 1930's and 1970's was likewise not felt to be generally associated with a widespread increased contamination of water supplies or with deteriorating water systems with one exception. In the late 1970's an increased number of waterborne outbreaks of giardiasis were reported, especially in the northeastern, northwestern, and Rocky Mountain states where most surface waters are not filtered, and although there was increased recognition of giardiasis as a waterborne disease and increased interest in giardiasis surveillance during this period, this increase in the occurrence of waterborne outbreaks of giardiasis is felt to be primarily a result of increased contamination and the lack of adequate treatment for surface water supplies in these areas.

Because the waterborne outbreak reporting system is voluntary, the differences in the occurrence of waterborne outbreaks during this sixty-one year period must be largely attributed to differences over the years in the reporting of outbreaks by state and local health departments and interests of others in compiling these reports. Reporting depends primarily upon the capabilities of the state health department to conduct disease surveillance, to follow up reports of unusual occurrences of illness and complaints, and to investigate outbreaks, prepare, and forward the reports for compilation. Whether an outbreak will be recognized and investigated depends upon many factors including the severity of disease, the number of individuals affected, and the type of water system. Not only must the outbreak be recognized and investigated, but information about the outbreak must also be made available to those individuals or federal agencies who compile the statistics.

Evidence to support the ascertion that the increase and decrease of outbreaks over this time period are primarily the results of reporting differences can be obtained by examining the reporting of waterborne outbreaks by the various states. For example eleven states reported 55.4 percent of all waterborne outbreaks that occurred during this sixty-one year period (Table 4). The combined number of outbreaks reported by these eleven states varied for each decade from 42 percent during 1961 through 1970 to 72 percent during 1941 through 1950. It is difficult to believe that most of the waterborne outbreaks during this sixty-one year period occurred in these particular states solely because of increased contamination of water supplies, deteriorating water systems, or treatment deficiencies.

Officials in Pennsylvania, Colorado, and Washington increased their waterborne disease surveillance activities during the 1970's and reported some 31 percent of all outbreaks during 1971 through 1980 (Table 4). Pennsylvania reported 20 percent of all waterborne outbreaks in the United States during 1971 through 1980 compared with only 2 percent for the previous twenty-year period. Colorado reported 7 percent of all waterborne outbreaks during 1971 through 1980 compared with 4 percent for the previous twenty-year period and Washington reported more than 4 percent of all waterborne outbreaks during 1971 through 1980 compared with less than 2 percent for the previous twenty-year period.

The large number of waterborne outbreaks which occurred during 1941-50 can be attributed primarily to an active surveillance program conducted in New York, as this state accounted for 46 percent of all waterborne outbreaks reported during this period (Table 4). During the previous twenty-one year period, 18 percent of all waterborne outbreaks had been reported by New York, but during the subsequent thirty-year period of 1951 through 1980, only 7 percent of all waterborne outbreaks were reported by New York. The active reporting of waterborne outbreaks by New York during 1938 through 1945 has been discussed by Eliassen and Cummings.[4] No explanations, however, have been provided for the decreased occurrence of waterborne outbreaks in New York during 1951 through 1980, and less active surveillance is one possible explanation.

Among the eleven states which reported the most outbreaks, no single state consistently reported large numbers of waterborne outbreaks over the entire period (Table 4). Some states reported more waterborne outbreaks in the earlier years of the period than in the more recent years while others reported more waterborne outbreaks in recent years. The number of reported waterborne outbreaks was compared with an expected number based on the marginal probabilities of waterborne outbreaks for each state for each time period (Table 5). Except for 1941 through 1950 when only New York reported more waterborne outbreaks than expected, three to five states reported more waterborne outbreaks than expected in each time period. All of the states except Indiana reported more than the expected number of waterborne outbreaks in at least two time periods, but only California, Oregon, Washington, Colorado, and New York reported more than the expected number in at least two consecutive time periods. A trend over time for any state to observe more than the expected number of waterborne outbreaks would suggest an increased contamination or deterioration of water supplies, and inconsistencies in observing greater or fewer than the expected number of waterborne outbreaks would suggest surveillance and reporting differences. Because water sources, types of treatment, and contamination problems for water systems are and have been generally similar for states in the same region, it is anticipated that the occurrence of waterborne outbreaks would be similar among the states of a region unless there were differences in surveillance and reporting activities. For example, it is difficult to believe that differences in the occurrence of outbreaks in Ohio, Indiana, and Illinois reflect any more than differences in reporting. If, however, there were a consistency among states within a region to observe more than the expected number of waterborne outbreaks over similar time periods, it would be difficult to exclude the possibility of widespread increased contamination or general deterioration of water supplies, as waterborne outbreaks would likely be detected with increased frequency regardless of surveillance and reporting differences among states.

Prior to 1951, no trend over time was apparent for any state to consistently report more waterborne outbreaks than expected or for states within a region to report more than the expected number. This suggests that the occurrence of outbreaks in the United States prior to 1951 was likely influenced by inconsistencies in the detection, investigation, and reporting of outbreaks. After 1951, the four western states consistently reported more outbreaks than expected compared with the middle western and eastern states. Although not shown in Table 3, the New England states of Maine, Connecticut, Massachusetts, New Hampshire, Rhode Island, and Vermont all reported more waterborne outbreaks than expected during 1971 through 1980. This consistency among the northwestern and New England states to report more than the expected number of waterborne outbreaks suggests that increased contamination or deterioration of water supplies as well as better reporting may be responsible for the observed recent increase in waterborne outbreaks. A reason already discussed is the increase in waterborne giardiasis in these areas caused by use of untreated or disinfected only surface water.

Outbreaks in community water systems, which number about 59,000 and serve about 180 million people, are probably the most likely to be reported. Outbreaks in noncommunity systems, which number about 240,000 and serve about 20 million people, primarily transients, are the next most likely to be reported, although it is often difficult to suspect or investigate a common source when travelers become ill. Travelers are likely to become ill after leaving the area where the illness was contracted, and if medical attention is sought, the illness may be reported to different health authorities who may have no knowledge of similar problems outside their area of jurisdiction and may not suspect a common source. Even if an outbreak is suspected and investigated, it is often difficult to obtain accurate information on the magnitude of the outbreak because information may not be available to determine who had been exposed or how to contact the exposed individuals. The publicity associated with recent giardiasis outbreaks in travelers, however, have been responsible for physicians and health departments becoming more aware of the possibility of common-source outbreaks among travelers and more suspicious when illness is reported after vacation or travel periods. Outbreaks in individual water systems, which serve about 30 million people, are least likely to be reported for several reasons. Many health departments lack the legislative authority or lack sufficient resources to conduct water quality surveillance programs for individual water systems and to adequately investigate sporadic reports of disease in rural areas. In many instances illness occurring in rural areas is not recognized as possibly transmitted by contaminated water because (1) the illness is mild and medical attention is not sought and (2) if medical attention is obtained few individuals or only family members are affected, and a common source is not considered (person-to-person transmission is generally assumed). Reportable diseases such as typhoid fever are likely, however, to be investigated and in many cases are found to be waterborne.

It is difficult to ascertain the number of waterborne outbreaks that go undetected or unreported. One estimate, based on data collected from 1946-70, was that about one-half of the waterborne outbreaks in community water systems and about one-third of those in noncommunity systems are detected, investigated, and reported.[8] During a two-year period of improved waterborne disease surveillance in Colorado in 1980-82, 11 waterborne outbreaks were documented compared to six waterborne outbreaks during the previous three-year period.[27] A study of the occurrence of foodborne outbreaks in Washington State indicated that prior to initiation of improved surveillance and investigation only one foodborne outbreak in ten had been recognized and reported.[28] Although this study considered only the reporting of foodborne outbreaks, the results may be applicable to waterborne outbreaks, especially those that occur in noncommunity water systems because of the similarities in recognition and investigation of these kinds of outbreaks. A waterborne outbreak[29] in a residential community of 6500 persons in Florida is a good example of how an active disease surveillance program can help detect outbreaks. Initially, only 10 cases of shigellosis were recognized by health authorities, but further investigation demonstrated an additional 1200 illnesses. If local health authorities had not been conducting shigellosis surveillance, the initial 10 cases might never have been recognized as an unusual occurrence, and an outbreak of waterborne disease as large as this might have gone undetected.

B. Cases of Illness

Cases of illness caused by waterborne outbreaks during the sixty-one year period ranged from a minimum of 76 cases of illness in 1955 to a maximum of 45,992 cases of illness in 1926 with a mean of 6,435.6 (SD 9,297.9) cases of illness and a median of 2,634 cases of illness for the entire period (Figure 6). Although the numbers are quite variable from year to year, the number of illnesses generally declined from 1940 through 1955 and increased from 1955 through 1980. Despite the recent increase in reported waterborne outbreaks and the apparent increase in cases of illness caused by these outbreaks, the incidence of waterborne disease has decreased from approximately 8 cases of waterborne disease per 100,000 person-years in 1920-40 to approximately 4 cases per 100,000 person-years in 1971-80 (Figure 7).

The magnitude of waterborne outbreaks depend upon the type of water system affected. For the entire sixty-one year period, community water systems averaged 559 illnesses per outbreak, noncommunity systems averaged 84 illnesses per outbreak, and individual systems averaged 22 illness per out break. Over one-half of the outbreaks in community water systems resulted in fewer than 51 cases of illness, and over 75 percent of the outbreaks resulted in fewer than 200 cases of illness (Table 6). Only eight percent of the outbreaks in community water systems resulted in more than 1000 illnesses. Approximately 92 percent of the outbreaks reported in noncommunity and individual water systems resulted in fewer than 200 illnesses and 50 illnesses respectively (Table 6).

There appeared to be no general trend over time in the magnitude of waterborne outbreaks occurring in community, noncommunity, and individual water systems (Figures 8-11). For outbreaks in all water systems, the average number of cases of waterborne illness per outbreak varied from 100 to 125 in five time periods, 224-256 in three time periods, and 504-681 in three time periods (Figure 8). For most time periods, waterborne outbreaks in community water systems averaged 151-554 cases of waterborne illness per outbreak (Figure 9). Because of two large outbreaks reported in 1965, 2432 cases of illness per outbreak occurred during 1961 through 1965. The average number of cases of waterborne illness per outbreak in noncommunity water systems varied from 39 during 1956 through 1960 to 166 during 1926 through 1930 (Figure 10) and in individual water systems varied from 9 during 1971 through 1975 to 47 during 1966 through 1970 (Figure 11).

C. Deaths

There were 1083 deaths associated with waterborne outbreaks during this sixty-one year period. The majority of these deaths occurred because of waterborne outbreaks of typhoid fever (Table 7) and occurred early in the period (Figure 12. Eighty-four percent of the deaths occurred prior to 1936, and less than one percent of the deaths occurred after 1970. Most deaths were due to typhoid fever (87.1 percent), amebiasis (9.4 percent), shigellosis (1.3 percent), and acute chemical poisonings (1.0 percent). Almost all deaths due to typhoid fever (94 percent) and amebiasis (96 percent) occurred prior to 1941. All deaths due to shigellosis and acute chemical poisonings occurred after 1940, and these are the primary causes of death in recent waterborne outbreaks (Table 7). Seventy-one percent of all deaths resulted from outbreaks in community water systems, and twenty-one percent of all deaths resulted from outbreaks in individual water systems (Table 8). For waterborne outbreaks which occurred in community systems, typhoid fever and amebiasis were the primary causes of death. Typhoid fever caused the most deaths in noncommunity water system outbreaks while typhoid fever, shigellosis, and acute chemical poisonings caused the most deaths in individual water system outbreaks.

Deaths were reported in 231 waterborne outbreaks with a mean of 4.7 deaths occurring in these outbreaks. Deaths due to typhoid fever occurred in 207 waterborne outbreaks. In those outbreaks in community water systems where a death occurred, the mean number of typhoid fever deaths was about one-half that of non-typhoid fever deaths, whereas in noncommunity and individual water systems the mean number of typhoid fever deaths was twice that of non-typhoid fever deaths (Table 9).

D. Seasonal Occurrence

A distinct seasonal occurrence of waterborne outbreaks was observed for noncommunity and individual water systems but not for community water systems (Figures 13-15). Outbreaks in noncommunity water systems occurred most frequently during June through August, and outbreaks in individual water systems occurred most frequently during June through September. Outbreaks in noncommunity systems affected primarily travelers, campers, restaurant patrons, and visitors to recreational areas, and the seasonal distribution of waterborne outbreaks may be due to either increased contamination of water supplies during the summer or an increased number of susceptible individuals using water supplies which are always contaminated. An analysis of outbreaks in noncommunity water systems shows the seasonal increase in outbreaks to be primarily caused by outbreaks which affect only visitors, and this suggests that the increased use by more susceptible individuals may be important as a possible explanation for the seasonal variation of outbreaks in noncommunity systems. The increased occurrence of outbreaks in individual water supplies during the summer months is caused primarily by outbreaks among rural residents and farm families. It is difficult to make a case for the importance of an increased number of susceptible individuals as an explanation for the seasonal variation of outbreaks in individual water systems, and increased contamination of individual water supplies during the summer may be the primary reason for the seasonal variation. Increased water demand placed upon marginal sources of water supply during the summer may also contribute to the summer increase of outbreaks in both noncommunity and individual water supplies, but this could not be ascertained from the available data.

E. Etiologic Agents and Waterborne Diseases

An etiologic agent was determined in 56 percent of the waterborne outbreaks (Table 10). The remaining outbreaks resulted in illness categorized as acute gastroenteritis characterized by symptoms including abdominal cramps, nausea, vomiting, and diarrhea occurring 12 to 48 hours after the consumption of contaminated water. Only during 1920 through 1935 and 1956 through 1970 were more waterborne outbreaks reported with a defined etiology than with an undefined etiology (Figure 16). It is difficult to estimate how many of the gastroenteritis outbreaks were caused by organisms which are commonly transmitted by water, but an etiologic agent was not isolated because the appropriate laboratory analysis was not conducted or not available at the time or because the clinical specimens were not collected in a timely manner. In many of the outbreaks, the search for an etiologic agent was limited to those organisms easily cultured, and the outbreaks could have been caused by unrecognized or less frequently identified etiologic agents. In some of the largest outbreaks occurring in recent years, an etiology could not be established even though there was extensive laboratory analysis of both human specimens and water samples including appropriate tests for newly recognized bacterial and viral pathogens, parasites, and chemicals. Although several newly recognized etiologic agents have been uncovered in recent years, additional unrecognized agents may be responsible for waterborne gastroenteritis.

The diseases most frequently transmitted by contaminated drinking water in the United States during 1920 through 1980 were acute gastroenteritis of undetermined etiology, typhoid fever, shigellosis, hepatitis A, giardiasis, and acute chemical poisonings. The pathogen most commonly identified in waterborne outbreaks prior to 1966 was _Salmonella typhi_. During 1966 through 1975, hepatitis A and _Shigella_ were the two most frequently identified causes of waterborne outbreaks, and in the most recent period _Giardia lamblia_, a flagellated protozoan responsible for giardiasis, was the most commonly identified pathogen.

Although waterborne outbreaks of salmonellosis, tularemia, amebiasis, para-typhoid fever, leptospirosis, and poliomyelitis have been reported, the transmission of these diseases in the United States by consumption of contaminated water appears to be of minor importance. In recent years waterborne viral gastroenteritis has been reported with increasing frequency because of the availability of more sensitive laboratory techniques for identification of viral agents, and it is possible that viral agents, as well as some of the newly recognized bacterial agents (toxigenic _Escherichia coli_, _Campylobacter fetus_, _Yersinia enterocolitica_), have been important causes of waterborne outbreaks of gastroenteritis of undetermined etiology.

Waterborne outbreaks of typhoid fever have declined dramatically during this sixty-one year period (Figure 17). During 1920 through 1925, 127 waterborne outbreaks of typhoid fever were reported while only four were reported during 1971 through 1975 and none were reported during 1976 through 1980. The number of reported waterborne outbreaks of giardiasis and acute chemical poisonings have increased over the past 35 years especially since 1970 (Figure 18). The number of reported waterborne outbreaks of shigellosis and salmonellosis have been relatively stable over the years with an average of approximately 9 outbreaks of shigellosis reported during each five-year period since 1936 (Figure 17) and 2.5 outbreaks of salmonellosis reported during each five-year period since 1946 (Figure 17). From 1946 through 1975, hepatitis A was an important cause of waterborne outbreaks, but no waterborne outbreaks of hepatitis A were reported during 1976-80 (Figure 18). In general, the occurrence of waterborne outbreaks of acute gastroenteritis of undetermined etiology followed a trend similar to the reporting of all waterborne outbreaks over the sixty-one year period (Figure 17). After 1935, more waterborne outbreaks of acute gastroenteritis were reported in each five-year period than were waterborne outbreaks of any other single illness (Figure 17-18).

1. Seasonal Variation

There was a distinct seasonal distribution of waterborne outbreaks of acute gastroenteritis with most outbreaks occurring in the months of June, July, and August (Figure 19). Most of the waterborne outbreaks of shigellosis occurred during these same months (Figure 20). Seasonal distributions were apparent also for waterborne outbreaks of typhoid fever and hepatitis A, and approximately 40 percent of these outbreaks occurred during July, August, and September (Figure 21-22). Although less data are available, more waterborne outbreaks of salmonellosis and viral gastroenteritis outbreaks occurred in July than any other month (Figure 23-24). More waterborne outbreaks of giardiasis occurred in June and September (Figure 25) and a seasonal distribution for these outbreaks is not apparent until outbreaks are categorized according to the population affected (Figure 26). Most of the waterborne outbreaks of giardiasis which affected visitors or travelers were reported during May through September, whereas outbreaks affecting usual residents occurred primarily in the spring and fall. Unlike the waterborne outbreaks of infectious disease, acute chemical poisonings exhibited no evidence of a seasonal distribution for occurrence, but more chemical poisonings occurred in November than in any other month (Figure 27).

2. Importance of Waterborne Transmission

Waterborne infectious diseases are generally transmitted by the fecal-oral route from human to human or animal to human, and drinking water is only one of several possible sources of infection. An exception is dracontiasis or guinea worm disease, which is transmitted exclusively through drinking water, but this disease is unlikely to be contracted in the United States. Dracontiasis occurs primarily in India, West Africa, Northeastern Africa, the Middle East, the West Indies, and Northeastern South America and is transmitted through contaminated step-wells and ponds where infected individuals wade to obtain water. Tularemia, an infectious disease of rodents and rabbits which can also occur in domestic animals, is occasionally transmitted to man through drinking water, but the more important routes of transmission are: contact through wounds, unbroken skin, or conjunctiva; bites of arthropids; inhalation of dust from contaminated areas; ingestion of insufficiently cooked rabbit. Tularemia is not directly transmitted from one person to another. Only two small outbreaks caused by drinking contaminated water from surface sources have been documented in the United States. Leptospirosis is frequently an occupational disease of farmers, sewer workers, veterinarians, abattoir and fish workers, and rice and sugar cane-field workers who are exposed to urine or tissues of infected animals or to fresh water contaminated by urine of infected domestic or wild animals. An annual average of 75 cases of leptospirosis were reported in the United States during 1971 through 1980.[30] The waterborne transmission from nonoccupational sources is generally through the recreational use of contaminated water, however, one waterborne outbreak has been reported where drinking water which became contaminated in a storage container caused illness in nine individuals.

Cholera is the classic waterborne disease which is almost always transmitted by ingestion of contaminated water. Fortunately, cholera rarely occurs today in the United States, but several cases of nonlaboratory-acquired *V. cholerae* infection have recently been reported in the United States where the source of infection could not be identified. The largest waterborne outbreak of cholera in the United States during this century occurred in 1981 when *V. cholera* 01 was found to be responsible for 17 cases of severe diarrhea caused by sewage contamination of an oil rig's private water system.[31]

Typhoid fever is an enteric infection often transmitted by contaminated drinking water. Since 1920, no more than five percent of the reported cases of typhoid fever in the United States has been transmitted via contaminated drinking water except during 1971 through 1975 when the largest outbreak[32] of typhoid fever since 1936 occurred in a Florida labor camp supplied with contaminated well water (Figure 28). In most periods cases of typhoid fever associated with waterborne outbreaks represent about two percent of all reported cases of typhoid fever. Contaminated drinking water has also been responsible for the transmission of paratyphoid fever and salmonellosis. Only four small waterborne outbreaks of paratyphoid fever have been reported in the United States. Nineteen waterborne outbreaks of salmonellosis have been reported, including the large outbreak of 16,000 cases of illness in Riverside, California,[33] in 1965. Generally less than one percent of _salmonella_ gastroenteritis in the United States has been transmitted via contaminated drinking water, but during the period which included the Riverside outbreak, 24 percent of the reported cases of _salmonella_ gastroenteritis occurred as the result of waterborne outbreaks (Figure 29).

Another enteric disease often transmitted by contaminated drinking water in the United States is shigellosis. The symptoms are relatively similar to salmonellosis, but _shigella_ infection produces bloody stools and rectal pain more frequently. No more than six percent of the reported cases of shigellosis in the United States has occurred as the result of waterborne outbreaks, and generally the cases of shigellosis caused by contaminated drinking water represent about two percent of all reported cases of shigellosis (Figure 30).

Hepatitis A is a viral disease which has long been recognized to be transmitted by contaminated drinking water. The virus produces symptoms of nausea, vomiting, muscle aches, and jaundice occurring approximately 15-45 days after exposure. The long incubation period tends to obscure the relationship between illness and consumption of contaminated water, and waterborne outbreaks are often not recognized. Diagnosis is made by history, physical examination, tests of liver function, and serologic studies. In the United

States, generally less than one percent of the reported cases of hepatitis A has resulted from waterborne outbreaks (Figure 31). Batik et al.[34] studied the impact of various water supply characteristics on the endemic rates of hepatitis A in a state identified as having a good surveillance system. Although no statistically significant associations were found between endemic hepatitis A rates and water supply characteristics, the study size was sufficient to estimate that the total variation of hepatitis A rates attributable to water supply characteristics was probably less than 8 percent of the reported cases of hepatitis from all causes.

In recent years giardiasis has been a frequent cause of waterborne disease outbreaks in the United States. The etiologic agent is the protozoan *Giardia lamblia* which exists in a cyst form that is resistent to the usual disinfection provided for the treatment of drinking water. The organism produces a chronic (more than 1 week) diarrhea syndrome that is accompanied by weight loss, epigastric pain, and flatulence. Diagnosis is established by identifying cysts or trophozoites in fecal material or in fluid from the upper small bowel; however, laboratory confirmation may be difficult. Outbreaks are generally caused by ingestion of untreated stream water in mountainous areas and treated surface waters which have been disinfected but either not filtered or not properly filtered. Beavers have been implicated as the source of infection in some outbreaks where no obvious source of human fecal contamination was found. In the United States, contaminated drinking water is an important source of transmission of giardiasis, but it is difficult to quantify this because reporting of giardiasis has been sporadic until recently. Cases of giardiasis are optionally reported by certain states, and during 1976 through 1980 an average of 11,700 cases were reported in the United States.[30] The 14,416 cases of waterborne giardiasis occurring during 1976 through 1980 represent 25 percent of these optionally reported cases of giardiasis from all causes during this five-year period. Wild and domestic animals are included in the cycle of transmission, and person-to-person transmission, especially through day care centers is also important.

Entamoeba histolytica is the protozoan causing amoebic dysentery or amebiasis. Most infections are asymptomatic, and intestinal disease varies from mild abdominal discomfort with diarrhea containing blood to acute dysentery with fever, chills, and bloody or mucoid diarrhea. Some infections result in invasion of the mucosal lining of the intestine, and the organism may be disseminated via the blood stream, producing abscess of the liver. Humans are the only reservoir and the organism is transmitted by the fecal-oral route. An annual average of 3,197 cases of amebiasis were reported in the United States during 1971 through 1980.[30] Outbreaks of amebiasis are caused by sewage-contaminated water, but the last reported waterborne outbreak in the United States affected only 31 individuals and occurred in 1953. The largest waterborne outbreak of amebiasis occurred in 1933 in Chicago and was caused by sewage entering the water system of a hotel through a cross-connection.[1] This outbreak resulted in at least 1409 cases of amebiasis and 98 deaths among guests and employees of two Chicago hotels.

Poliomyelitis has been suspected of being transmitted via contaminated drinking water. The first reported epidemic of poliomyelitis in the United States occurred in New England,[35] and Caverly[36] suggested that the disease might be waterborne. Eight outbreaks of poliomyelitis in Europe and North

America have been attributed to contaminated drinking water, but Mosley[37] feels that only the outbreak[38,39] which occurred in Huskerville, Nebraska, in 1952 had adequate documentation of waterborne transmission. More than 10 percent of the 347 children in the affected area developed poliomyelitis over a five-week period and 16 children suffered paralytic disease. During this same period, no cases of paralytic or nonparalytic poliomyelitis occurred among 256 children residing in an adjoining section of the village. The epidemiologic study showed a spatial relationship between the distribution of cases and the location of water closets with flush valves containing no vaccum breakers and showed a temporal relationship between the outbreak and the occurrence of extreme fluctuations of pressure in the water mains. It was felt that fecal contamination of the water mains could have been caused by backsiphonage, and the evidence pointed to the proximate fecal contamination of the water as the sole factor in explaining the distribution of poliomyelitis within the community. Immunological studies further confirmed that type I poliomyelitis had been transmitted by contaminated water. An outbreak of waterborne gastroenteritis occurred at a restaurant in Michigan in 1970, and poliovirus 2 was reported to have been recovered from the well used as a drinking water source.[40] No cases of poliomyelitis, however, were detected among those who had become ill with nausea, vomiting, and diarrhea.

Although gastroenteritis caused by _Yersinia enterocolitica_ has been suspected to be acquired by drinking contaminated water in the United States, sufficient documentation of this etiology from waterborne outbreaks was lacking until a small outbreak[31] of 15 cases was reported in Pennsylvania in 1981. Waterborne outbreaks of gastroenteritis in the United States have also been caused by enterotoxigenic _Escherichia coli_, _Campylobacter fetus_ ssp. jejuni, and viral agents. These organisms are all transmitted by the human fecal-oral route and domestic and wild animals are felt to be important reservoirs for C. jejuni and Y. enterocolitica. Gastroenteritis and diarrhea caused by these organisms are not included in the list of notifiable or optionally reported diseases[30] and it is difficult to estimate the importance of waterborne transmission for these etiologies.

3. Waterborne Diseases

There were 297,557 cases of waterborne gastroenteritis of undetermined etiology and this accounts for about 77 percent of all waterborne disease reported during the sixty-one year period. The average number of cases of waterborne gastroenteritis varied from 461 cases annually during 1956 through 1960 to 19,351 cases annually during 1936-40 (Figure 32). The 28 waterborne outbreaks of undetermined etiology in 1920 through 1930 resulted in an average of 8332 cases of gastroenteritis annually compared with an annual average of 942 cases of typhoid fever resulting from 227 waterborne outbreaks during the same period (Figure 33). The number of cases of waterborne gastroenteritis exceeded the number of cases of other specifically identified waterborne diseases in each subsequent five-year period except 1956 through 1960 (Figures 32-42).

From 1920 through 1965 more waterborne outbreaks of typhoid fever were reported than were waterborne outbreaks of other defined etiologies, but after 1946 these typhoid outbreaks were relatively small and resulted in less than 100 cases of typhoid annually. From 1936 through 1961 waterborne outbreaks of shigellosis resulted in more cases of illness (Figures 34-38) and from 1961 through 1965 waterborne outbreaks of salmonellosis resulted in more cases of illness than cases of illness due to waterborne outbreaks of typhoid fever (Figure 39). During 1966 through 1970, more cases of waterborne shigellosis were reported than any other waterborne disease of defined etiology (Figure 40), and during 1971 through 1980 more cases of waterborne giardiasis were reported than any other waterborne disease of defined etiology (Figure 41-42).

a. Gastroenteritis

Many causes of acute gastroenteritis are possible, and it has long been suspected that "nonbacterial" causes were important. It is only recently that viral agents have been identified as a cause of acute gastroenteritis, as significant advances in laboratory techniques have occurred, and these agents can now be detected through immunoassays or electron microscopy. Although it was found possible to readily cultivate the major viral respiratory pathogens in cell culture or laboratory animals, efforts to identify and cultivate the viral gastroenteritis agents in cell cultures or laboratory animals had not been successful. Acute infectious nonbacterial gastroenteritis occurs primarily in two epidemiologically distinct forms and is caused in humans by at least two distinct groups of viruses.[41-49] The 70-nm rotaviruses have been shown to be a major cause of acute gastroenteritis in infants and young children. This form of illness typically produces severe diarrhea lasting for five to eight days usually accompanied by fever and vomiting. Infants may become severely dehydrated. It is reported that rotavirus infection is responsible for about half the cases of infantile diarrhea that require hospitalization worldwide. In temperate climates the illness is common during the cooler months. Clinical disease may occur among family and adult contacts of ill infants. The illness is usually sporadic but is occasionally epidemic, and although it occurs predominantly in young children, it can affect adults. The other viruses associated with acute nonbacterial gastroenteritis are less well characterized. Virus like 27-nm particles have been identified in stool filtrates from specimens obtained during gastroenteritis outbreaks in Norwalk, Ohio, Honolulu, Hawaii, and Montgomery County, Maryland. At least three serologically distinct 27-nm particles have been identified. The Norwalk virus is the prototype and most extensively studied of this group which is referred to as Norwalk-like agents or viruses. Gastroenteritis caused by Norwalk virus is typically an explosive but selflimited illness usually lasting 24 to 48 hours, and symptoms include vomiting, diarrhea, nausea, abdominal cramps, headache, low-grade fever, anorexia, and maliase. It is characteristically epidemic. The Norwalk-like agents have been responsible for family and community outbreaks among older children and adults and are reported to cause one third of the epidemics of viral gastroenteritis that occur in the United States. Although some of rotaviruses have recently been grown by special techniques in cell culture, Norwalk virus has not been cultivated in vitro and produces no disease in inoculated laboratory animals.

Norwalk-like agents are suspected to be the cause of a number of waterborne gastroenteritis outbreaks of undetermined etiology which have occurred in the United States. Ten waterborne outbreaks of gastroenteritis attributed to Norwalk or Norwalk-like agents on the basis of serologic testing were reported during 1976 through 1980 in the United States.[50] In addition, two outbreaks of Norwalk gastrointestinal illness were associated with swimming in recreational lakes in Georgia[51] and in Michigan;[52] two outbreaks were associated with the consumption of oysters;[50,53] and two outbreaks were associated with consumption of water on cruise ships.[50] Recognizing that most gastroenteritis outbreaks are not specifically investigated for a virus etiology, Kaplan et al.[54] reviewed the records of acute gastrointestinal outbreaks to determine the proportion of outbreaks that were clinically and epidemiologically consistent with Norwalk-like virus infection using the criteria: negative stool cultures for bacterial pathogens, mean or median duration of illness 12-60 hours, vomiting in 50 percent or more of the cases, and if known, a mean or median incubation period of 24-48 hours. Ninety-six of the waterborne outbreaks reported during 1976 through 1979 had sufficient data for evaluation, and it was found 22 waterborne outbreak met the criteria for Norwalk-like virus infection. Only six of these outbreaks had serologic testing for Norwalk virus and had specifically been identified with a viral etiology. The remaining 16 outbreaks had been classified as waterborne gastroenteritis of undetermined etiology. If the classification of waterborne outbreaks were changed to reflect these findings, the statistics would show 15 percent of the waterborne outbreaks during 1976 through 1979 to be of viral etiology rather than the reported 4 percent and 48 percent to be of gastroenteritis of undetermined etiology rather than the reported 59 percent.

The ten reported waterborne outbreaks of viral gastroenteritis caused by Norwalk or Norwalk-like agents occurred primarily in noncommunity water systems and affected 3147 individuals, primarily visitors. Six outbreaks occurred in well water systems where the water received no treatment or the disinfection provided was either inadequate of interrupted. Two outbreaks were caused by cross-connections or backsiphonage. Coliform contamination of the water supply was evident in all outbreaks.

The following outbreaks illustrate that viral agents contribute to waterborne gastrointestinal disease in the United States and substantiate previous reports that outbreaks with a high attack rate, predominance of upper gastrointestinal symptoms, and relatively short duration of illness are compatible with viral gastroenteritis. Morens et al.[55] investigated an outbreak at a resort camp in Colorado in 1976 where 418 (55 percent) persons reported gastroenteritis at the camp or within a week of leaving it. Symptoms included vomiting (81 percent), diarrhea (65 percent) and fever (49 percent). The median duration of illness was 24 hours. The attack rate increased with increasing consumption of water or iced beverages. The camp was supplied with water by a natural spring in a meadow at the base of a small hill. At the top of the hill was a private cabin with a septic tank approximately 50 feet above the spring. Prior to the outbreak maintenance personnel noted malfunctioning of the chlorinator at the spring and turned it off for several hours while making repairs. Fluorescein dye flushed into the cabin wastewater system rapidly appeared in the spring and in the camp tap water. Routine laboratory tests did not reveal bacterial, viral, or parasitic pathogens, but immune electron microscopy detected 27-nm viruslike particles in two of five diarrheal stool filtrates. Oral administration of one of these bacteria-free filtrates to two volunteers induced a gastrointestinal illness similar to that observed in the camp visitors. This outbreak has not been classified in the tabulation (Appendix A) among those with a viral etiology primarily because of the lack of serologic evidence, but it is considered to be highly suspect based on the identification of the virus like particle in the stool specimens.

A survey of 57 groups visiting a camp in northeastern Pennsylvania between May 1, 1978 and June 16, 1978, revealed that 13 groups had experienced illness in over 15 percent of their members.[56] A total of 350 persons were reported to have been ill. Serum and stool specimens collected from ill members of the last group that visited the camp were negative for bacterial pathogens. However, three of five ill persons had a fourfold titer rise in antibody to a Norwalk-like agent; two controls were negative. The illness in this group was characterized by vomiting (81 percent), abdominal pain (74 perecnt), nausea (67 percent), and diarrhea (56 percent). An association was found between the quantity of camp water consumed and illness. A similar questionnaire, administered to two other ill groups, also showed an association between the quantity of camp water consumed and illness. Study of the water system demonstrated the presence of coliforms, inadequate chlorination, and several areas of possible contamination.

On July 27, 1978, an outbreak of gastroenteritis was reported from another summer camp in northeastern Pennsylvania.[56,57] The cases were characterized by abdominal pain (80 percent), nausea (73 percent), and vomiting (53 percent). Headache (47 percent), diarrhea (38 percent), and chills (38 percent) were also prominent findings. The median duration of illness was two days. Review of the infirmary records revealed 73 cases of gastroenteritis during the first session of summer camp, approximately 10 times the rate reported from the previous year. A sharp increase in cases began 48 hours after the arrival of the second-session campers. Consumption of five or more glasses a day of water or water-contained beverages was statistically associated with illness. Bacterial samples from the camp water supply revealed fecal coliforms, and although the well water was chlorinated, tests for residual chlorine level revealed no residual until July 28. No new cases were reported after July 29. Laboratory studies of stools from 10 patients and 10 controls revealed no bacterial pathogens. Three of three paired serum specimens, however, showed fourfold or greater rises to Norwalk-like agent by radioimmunoassay.

An explosive outbreak[58] of 467 cases of Norwalk-related viral gastroenteritis caused by contaminated drinking water occurred in an elementary school in Pierce County, Washington in May 1978. No bactrial or parasitic pathogens were identified in stool specimens and immune electron microscopy on three stool specimens did not reveal rotavirus or Norwalk-like agents. Acute and convalescent serum pairs from two of three persons, however, showed fourfold or greater antibody rises to the Norwalk antigen by radioimmunoassay. The water source at the school was contaminated on May 2 when sewage from a plugged septic tank entered a floor drain in the boiler room and likely entered the water system by backsiphonage through a cross-connection at the well-pump pressure tank. Illness compatible with Norwalk-related virus infection began approximately 24 to 48 hours later and affected some 70 percent of the persons exposed.

The first Norwalk-related outbreak associated with a contamination of a large municipal water system occurred in August 1980 in the Lindale area of Rome, Georgia.[59] The outbreak lasted for one week and affected over 1500 individuals. Water was likely contaminated through a cross-connection between the community water system and an industrial water system which was found to contain fecal coliforms. The clinical and epidemiologic findings were consistent with the cause being Norwalk-like agent. Rectal swabs from ill persons were negative for bacterial pathogens, and no viral particles were found in four stool specimens examined by immune electron microscopy. Twelve of 19 acute and convalescent serum pairs from patients demonstrated a fourfold rise in titer of antibody to Norwalk virus antigen.

Rotaviruses have not been shown to be an important cause of waterborne outbreaks, and Kaplan et al.[54] doubt that rotaviruses were a possible etiologic agent for the previously discussed gastroenteritis outbreaks which occurred during 1976 through 1979 and met his criteria for Norwalk-like illness. However, they have caused disease in adults as well as children and do play a role in adult travelers' diarrhea,[42,49] and three reports outside the United States have suggested the possibility of rotavirus transmission via drinking water.[60-62] An outbreak of 3172 cases of acute gastroenteritis affecting 30 percent of the population of a small Swedish town in January 1977 was suspected to be of waterborne origin and caused by rotavirus.[60] Particles with a diameter of 75 nm, similar in appearance to rotavirus, were detected in fecal specimens of acutely ill and convalescent patients. No Salmonella, Shigella, Yersinia, and cytopathogenic viruses were found in the ill and there was no indication of transmission from children to adults. The disease was characterized by diarrhea, vomiting, headache, muscular pain, and fever. Symptoms disappeared after 1 to 3 days. Observations suggested that the water supply was contaminated with wastewater. The contamination of water mains in a village of the Soviet Union reportedly caused rotavirus infection of 173 persons.[61] Rotaviruses were reported to have been isolated from stool specimens. All age groups were represented among patients, and children under 7 constituted only 10 percent of the patients. A contaminated water supply caused an outbreak of gastroenteritis in a private school in Rio de Janeiro in 1980 where rotavirus and Shigella sonnei were isolated from stool specimens.[62] The overall attack rate was 75 percent, and students in all grades were affected. Examination of initial stool specimens from 19 ill children revealed rotavirus in seven, S. sonnei in six, and both pathogens in four. Second and third collection of stool specimens yielded only S. sonnei. Eighteen paired sera showed seroconversion for rotavirus in four cases and for S. sonnei in seven cases.

Recent waterborne outbreaks have suggested that other viruses not yet fully characterized or other agents may be responsible for some waterborne gastroenteritis, as extensive laboratory analysis of both clinical specimens and water samples in several outbreaks could not establish an etiology. As has previously been noted, it is not possible to rule out a bacterial etiology for many of the early waterborne outbreaks of gastroenteritis, as laboratory analyses may not have been available or may not have been conducted as part of the investigation. The recent association of toxigenic E. coli, Y. enterocolytica, and C. fetus, with waterborne gastroenteritis suggests that these may also be important as causes of waterborne outbreaks of undetermined etiology. These bacteria are more difficult to cultivate in the laboratory than are the familiar bacterial pathogens, such as Salmonella and Shigella. However, sometimes it is possible to use symptoms of the illness to help distinguish bacterial gastroenteritis from viral gastroenteritis. The illness with each of these bacterial pathogens is usually prolonged and vomiting is usually not reported in the majority of cases.

There are at least three types of pathogenic E. coli. Invasive strains cause disease manifested by fever and mucoid and occasionally bloody diarrhea.

Enterotoxigenic strains cause disease ranging from mild diarrhea to seriously dehydrating cholera-like illness with profuse watery diarrhea, abdominal cramps, and vomiting. The enteropathogenic strains have generally been associated with outbreaks of acute diarrheal disease in newborn nurseries, and although they may produce diarrhea through the elaboration of enterotoxins, the pathogenic mechanisms have not been defined. Enterotoxigenic *E. coli* has been found to be a common cause of diarrhea in travelers to Brazil, Kenya, and Mexico.[63] In a prospective study[63] of travelers to Mexico, median duration of illness was 5 days and median onset of illness was 6 days after arrival.

Four waterborne outbreaks caused by enteropathogenic *E. coli* serotypes 0111:B4 and 0124:B27 were reported in the United States in 1967 and 1969, but the strains were not demonstrated to be pathogenic by either toxin production or tissue invasion. The first well-documented waterborne outbreak[64] caused by an enterotoxigenic strain of *E. coli* occurred in 1975 at Crater Lake National Park and affected more than 1000 individuals. Enterotoxigenic *E. coli* serotype 06:K15:H16 was isolated from ill persons and from a water sample. The park water supply was contaminated when an obstructed sewer line caused sewage to overflow into a spring. Although the spring was chlorinated, the facilities were improperly designed and did not provide adequate disinfection prior to distribution of the water. Outbreaks of gastroenteritis have been reported in passengers of cruise ships operating from U.S. ports, and several have been associated with contaminated drinking water.[65] A single serotype of *E. coli* that produced heat-labile enterotoxin without producing heat-stable enterotoxin was recovered from most of the passengers who contracted diarrheal illness aboard two successive cruises of a Miami-based cruise ship.[66] Clinical findings were similar to that caused by enterotoxigenic *E. coli* that produce only heat-stable and heat-labile. Epidemiologic evidence suggested the illness was associated with drinking water aboard the ship. Waterborne outbreaks of enterotoxigenic E. coli have also been reported in other countries. In Japan[67] 956 persons became ill, with diarrhea the primary symptom, after drinking water at Nagoya airport in September 1973. Enterotoxigenic E. coli serotypes 06:K:H16, 027:K:H7, 0148:K:H28 were isolated from well water and from human stool specimens. Karoly[68] reported a fatal case of illness caused by E. coli 0124:K72:B17 in well water in Europe.

The importantance of Y. enterocolitica as a cause of waterborne gastroenteritis of undetermined etiology in the United States is uncertain at this time. The organism has been found in surface waters and unchlorinated well waters in the states of Washington, Wisconsin, New York, California, and Colorado, Australia, Canada, Norway, Denmark, and Belgium and unchlorinated water in Washington State.[69-82] The most common symptoms of Y. enterocolitica infection in humans are fever, abdominal pain, and diarrhea, and cases have been reported in association with disease in domestic animals. The number of human cases that are recognized is small and largely dependent on the skill and experience of the clinician and laboratory. Y. enterocolitica is frequently isolated from wild and domestic animals. Fecal-oral transmission of the infection has been shown after contact with infected persons or animals and after eating or drinking contaminated food and water. The first sufficiently documented waterborne outbreak[30] in the United States was reported in 1981, and prior to that time, evidence for waterborne transmission was only suggestive.[81-82] A waterborne outbreak of gastroenteritis in which Y. enterocolitica was isolated from well water occurred at a Montana ski resort in 1974.[83] Illness was epidemiologically associated with drinking water and chlorination of the wells stopped the outbreak. The significance of finding *Y. enterocolitica* in the well water is unclear because rectal swab cultures from acutely ill persons were not examined for this organism. Christensen[84] reported isolation of *Y. enterocolitica*, biotype 4, serotype 0:3 from an unchlorinated well water supply in a rural area of Denmark. The well water was suspected as the source of infection for an 8-month-old child hospitalized with yersiniosis. A blood titer against serotype 0:3 was demonstrated. The well water was used in the preparation of baby food, but it could not be established whether enrichment of *Yersinia* in the baby food or direct ingestion of water was responsible for the infection.

C. jejuni has recently been recognized as a leading cause of bacterial gastroenteritis and has been identified as a cause of travelers' diarrhea.[85,86] *Campylobacter* is now isolated as commonly as *Salmonella* and *Shigella* from patients with diarrhea, however, the epidemiology and pathophysiology of campylobacter infection are still not well understood.[87] There are several species of *Campylobacter*, but the major pathogen of humans is *C. jejuni*.[85] In developed countries with good sanitation, most infections are seen in young adults. In less developed countries, children are most often affected. The incidence of infection increases during the summer months.[85] In North America, Europe, Africa, and Australia, studies have shown *C. jejuni* to be a pathogen in 3 to 11 percent of patients with diarrhea.[87] Mild infections may produce symptoms lasting for a single day and resembling those seen in viral gastroenteritis, but *C. jejuni* may also cause illness which mimics acute relapses of ulcerative colitis.[85] The predominant symptoms among persons ill enough to seek medical attention are diarrhea, abdominal pain, malaise, fever, nausea, and vomiting; a history of grossly bloody stools is also common.[85]

Abdominal pain may be the only symptom and may mimic acute appendicitis.[85] Illness is frequently self limiting lasting no more than a week, but about 20 percent of patients have a prolonged illness or relapse. The asymptomatic excretion of *Campylobacter* by humans is uncommon.[85] *Campylobacter* may be transmitted from animal and inanimate reservoirs to humans by direct contact with infected animals or through the ingestion of contaminated food or water.[85] Person-to-person transmission can also occur and transmission has been suggested by infants in day care centers.[86] *Campylobacter* species are widespread in animals as pathogens and commensals, and the reservoir for *C. jejuni* in nature is large.[86,87] *Campylobacter* organisms found in water are likely due to fecal contamination by wild or domestic animals, as the excretion of these organisms by humans is not widespread.

The first waterborne outbreak of gastroenteritis caused by *C. jejuni* in the United States occurred in 1978 in Bennington, Vermont and affected approximately 3000 people or 19 percent of the town's population.[88] The mean duration of illness was 4.6 days, and reported symptoms included cramps (87 percent), diarrhea (82 percent), malaise (73 percent), headache (47 percent), nausea (45 percent), fever (45 percent), vomiting (21 percent), and blood diarrhea (9 percent). *C. jejuni* was cultured from 15 of 42 rectal swabs from ill persons but not from rectal swabs from 23 persons who were not ill. *Campylobacter* organisms were not isolated from water samples or from specimens from wild or domestic animals. *Y. enterocolitica* were also isolated from four rectal swabs, but the data do not suggest that this organism was a cause of the outbreak. The illness was epidemiologically associated with drinking water, and the report of heavy rainfall several days before the outbreak and high turbidity of the water support the hypothesis that increased runoff from the watershed led to contamination of the water which was not filtered. Although the water was disinfected, records showed that throughout the period of the outbreak several areas of the town had no residual chlorine. Waterborne outbreaks have also been reported in Sweden[89] and the United Kingdom.[90] In an outbreak affecting approximately 2000 people in central Sweden in 1980, _C. jejuni_ was isolated from stool specimens of 221 of 263 ill persons.[89] There was strong circumstantial evidence that tap water was the source of infection, and the municipal water system may have been contaminated through cross-connections in the distribution system, as many houses maintained pumps to irrigate gardens with surface water. Reported symptoms included diarrhea (89 percent), abdominal pain (82 percent), nausea (57 percent), headache (56 percent), fever (53 percent), vomiting (19 percent), and blood in stools (6 percent). In an outbreak of gastroenteritis[90] affecting 234 pupils and 23 staff at a boarding school in the United Kingdom in 1981, _C. jejuni_ was isolated from ill persons and two samples of water from an open storage tank which supplied water to the main school building. The source of the water supply was an unchlorinated well. The most likely source of contamination was fecal material from birds or bats roosting on the storage tower and the nearby clock tower. The transmission of _Campylobacter_ enteritis through untreated, mountain streams has also been documented in the United States, and Taylor et al.[91] suggest that backcountry surface water can be an important source of _C. jejuni_. During the summers of 1980 and 1981, _C. jejuni_ was isolated from 23 percent of persons with diarrheal disease acquired in the area of Grand Teton National park, Wyoming; _G. lamblia_ was also isolated from 8 percent of ill persons. _Campylobacter_ enteritis occurred most frequently in young adults who had been hiking in wilderness areas and was statistically associated with drinking untreated surface water. A study[92] of persons with laboratory confirmed sporadic *C. jejuni* infection and controls matched for age and gender in Colorado in 1981, showed that drinking untreated water, drinking raw milk, and living in a household with a cat were risk factors for acquiring the infection. Camping itself was not associated with infection.

b. Typhoid Fever and Hepatitis A

The annual average number of cases of typhoid fever occurring in waterborne outbreaks decreased from 1216 cases during 1920 through 1925 to 53 cases during 1946 through 1950 and nine cases during 1966 through 1970 (Figure 43). An average of 44 cases of waterborne typhoid fever occurred during 1971 through 1975 as a result of the large outbreak at a labor camp in Florida[32] in 1973, and no cases of waterborne typhoid fever were reported during 1976 through 1980. This outbreak of 210 suspected and confirmed cases of typhoid fever at the South Dade Migrant Farm Labor Camp in Dade County, Florida, was the largest reported waterborne outbreak of typhoid fever in the United States since 1936. No deaths occurred, and the outbreak subsided with few secondary cases and no transmission to individuals not connected with the camp. The camp's water supply, two shallow wells, were implicated as the vehicle of infection. An engineering evaluation revealed that chlorination of the wells was interrupted prior to the outbreak, and it was felt that the water system became contaminated at that time. The aquifer was composed of solution channels, and the wells had a history of intermittent contamination. A young mentally retarded camp resident was identified as the index case, and the wells could have been contaminated from the adjacent day care center attended by the index case. The last reported waterborne outbreak of typhoid fever in the United States occurred in 1974 in the Dryden area of Chelan County, Washington, and affected 5 individuals consuming water from a poorly constructed shallow well approximately 15 feet deep. A typhoid carrier was identified in the neighborhood, and it was suspected that he used pit privies which were confirmed by fluorescein dye studies as a source of contamination of the well. S. typhi was also isolated from the well water.

As the number of cases of waterborne typhoid fever has declined, cases of waterborne hepatitis A have been reported more frequently, and after 1950 the number of cases resulting from waterborne outbreaks exceeded the cases of typhoid fever transmitted via drinking water (Figure 44). Although the waterborne transmission of hepatitis A did increase, the maximum number of cases resulting from waterborne outbreaks occurred during 1966 through 1970 when an average of 112 cases were reported annually.

Hepatitis A is one of three forms of viral hepatitis which are now recognized. Hepatitis A is caused by a picornavirus, is transmitted by the facel-oral route, does not become chronic, and no chronic virus carriers exist.[93] Hepatitis B is caused by an enveloped virus containing a circular, double-stranded form of DNA, is transmitted parenterally through inoculation of blood or blood products containing virus or through close personal contact with an infected person, and becomes chronic in some cases.[93] Agents of hepatitis non-A, non-B have not been identified, but it is possible to distinguish between a predominantly parenterally transmitted and an orally transmitted form.[93]

A specific laboratoty diagnosis of hepatitis A can be obtained by serologic studies or demonstration of hepatitis A particles or specific antigens in feces, and it has been demonstrated that hepatitis A virus may replicate in several cell culture systems.[93] Hepatitis A virus was reported to have been detected in a sample of well water obtained during a waterborne outbreak of 8000 cases of gastroenteritis which occurred among 13,000 residents of Georgetown, Texas, in June 1980.[94] Enteroviruses were also isolated from two of the city's four wells which were developed in a limestone aquifer. Thirty-six cases of hepatitis A occurred approximately one month after the gastroenteritis outbreak subsided compared with a normal incidence of less than two cases per month. There is little information on the risk of acquiring hepatitis A from drinking sewage-contaminated water in the United States, and although it has been suspected that hepatitis A might be transmitted during large outbreaks of waterborne gastroenteritis, this is the first report[94] which documents a significant occurrence of hepatitis A after a waterborne outbreak of gastroenteritis. Generally, the necessary surveillance has been lacking to confirm this "secondary wave" of hepatitis A cases in waterborne outbreaks of gastroenteritis. Neither of two large outbreaks of gastroenteritis due to sewage contamination at Pico Rivera[95] and Madera[96] was associated with an increase in reported cases of hepatitis A, and only one of 132 cases of gastroenteritis related to sewage-contaminated water in Pennsylvania[97] had any clinical evidence of hepatitis. Generally, outbreaks of waterborne hepatitis A occur without antecedant or sentinel gastroenteritis, and two reviews[98,99] of waterborne hepatitis A have shown that only nine of 28 waterborne outbreaks of hepatitis A and seven of 40 waterborne outbreaks of hepatitis A were preceded by gastroenteritis. Rosenberg et al.[100] conducted a survey among those exposed to sewage contaminated water during the outbreak of toxigenic *E. coli* gastroenteritis at Crater Lake and found only five cases of hepatitis A among 2206 persons who drank water but did not receive immune serum globulin within two weeks of exposure, an attack rate of 0.23 percent. No cases of hepatitis A occurred in 320 park staff and family members who had repeatedly been exposed to contaminated water. The incidence of Crater Lake-associated hepatitis A as determined from the three cases reported to State Health Departments at the time of the outbreak was 12 per 100,000 per year compared to the reported incidence for the United States of 10 per 100,000 per year.

Hepatitis caused by agents not serologically related to hepatitis A or B virus is referred to as hepatitis non-A, non-B. Evidence exists for more than one agent responsible for hepatitis non-A, non-B.[93] Epidemic hepatitis non-A, non-B has been reported from parts of Asia and the Middle East where the disease has been studied most extensively, and hepatitis with the characteristics of this disease has been seen in Europeans who have traveled to areas where the disease has occurred.[93] Epidemic hepatitis non-A, non-B is thought to be transmitted by the fecal-oral route, and contaminated water has been implicated as a cause of outbreaks in India, including the 1955 outbreak of 30,000 cases of hepatitis in Delhi.[101,102]

c. Shigellosis

Shigellosis remains endemic in the United States primarily because of direct person-to-person transmission, but common source outbreaks also occur. During 1961 through 1975 there were 110 common-source outbreaks and 16,541 cases of illness attributed to contaminated food and water.[103] The attack rate for both foodborne and waterborne shigellosis was 47 percent.[103] The vast majority of waterborne outbreaks of shigellosis has occurred because of the contamination of untreated groundwaters and lack of adequate disinfection for groundwater. Shigella has been the most frequently identified pathogen in waterborne outbreaks in groundwater systems.

The waterborne transmission of shigellosis has been relatively constant with approximately 500-600 cases reported annually during most periods (Figure 45). The number of cases of waterborne shigellosis reported annually ranged from 104 during 1961 through 1965 to 827 in 1936 through 1940. S. sonnei was identified more frequently (56 percent) in waterborne outbreaks of shigellosis during 1961 through 1980; S. flexneri was identified more frequently (43 percent) during 1936 through 1960 (Table 11). During 1961 through 1980, 5593 (81 percent) cases of S. sonnei gastroenteritis occurred in waterborne outbreaks compared to 2294 (19 percent) cases during 1936 through 1960. During 1961-80, 414 (6 percent) cases of S. flexneri gastroenteritis occurred in waterborne outbreaks compared with 7006 (57 percent) cases during 1936 through 1960. The change in Shigella species causing the majority of waterborne outbreaks and cases of illness from S. flexneri to S. sonnei cannot be explained by reporting differences and parallels a similar change in the predominant serotype in nationwide shigella isolations.[103]

6. Salmonellosis

Waterborne outbreaks of salmonellosis have not resulted in many illnesses with the exception of 1961 through 1965 when an average of 3285 cases of salmonellosis occurred in waterborne outbreaks and 1976 through 1980 when an average of 223 cases occurred (Figure 46). In each of these two periods, a single waterborne outbreak was responsible for the larger number of cases: an outbreak of S. typimurium gastroenteritis in Riverside, California,[33] in 1965 and an outbreak of 750 cases of S. typimurium gastroenteritis in Suffolk

County, New York in 1976.[103] The Riverside, California, salmonellosis outbreak in 1965 was one of the largest waterborne outbreaks to occur during the sixty-one year period.[33] An estimated 16,000 cases of illness occurred, at least 70 individuals were hospitalized, and three deaths resulted from this outbreak. The water supply was epidemiologically implicated, and S. typhimurium was isolated from the water. However, the source of contamination was not determined. Chlorination of the groundwater source stopped the outbreak. Coliforms were not detected during routine surveillance of the water system prior to the outbreak, and during the investigation it was found that salmonella were more numerous than E. coli in the water system. S. typhimurium was isolated from stool specimens and drinking water was epidemiologically implicated in the outbreak of salmonellosis at a large catering facility in Suffolk County, New York.[104] A submerged inlet in a clogged slop sink and other cross-connections were found, and it is believed that backsiphonage of contaminated water occurred after activation of booster pumps connected to the system. S. typhimurium was isolated from water in the slop sink. No contamination was found in the drinking water, but investigators felt that heavy use of the water system may have flushed the contamination from the system by the time water samples were collected.

e. Giardiasis

The number of cases of waterborne giardiasis occurring in the United States has increased dramatically over the past 15 years (Figure 47). The waterborne transmission of G. lamblia was suggested as early as 1946 by an epidemiologic investigation of an outbreak of amebiasis attributed to sewage contamination of a water supply in a Tokyo apartment building.[105] E. histolytica and G. lamblia were recovered from 96 (64 percent) and 116 (77 percent) occupants respectively; _G_. _lamblia_ was isolated from 86 perecnt of the occupants who experienced diarrhea with abdominal discomfort and had stools that were negative for _E_. _histolytica_. Reports of giardiasis in American travelers to the Soviet Union in the 1970s generally increased recognition, investigation, and reporting of this disease in the United States. The first reports involving American travelers appeared in 1970; Leningrad was implicated as the site of acquisition of the infection, and tap water was the probable mode of transmission.[106-108] The first waterborne outbreak of giardiasis documented in the United States occurred at Aspen, Colorado,[109] during December 1965 through January 1966. The outbreak came to the attention of the Center for Disease Control when a physician at the Center developed characteristic symptoms of giardiasis after return from a ski holiday at Aspen. His stools contained no bacterial pathogens but did contain large numbers of _G_. _lamblia_ cysts. A survey of 1094 skiers who had vacationed in Aspen during the 1965-66 ski season showed that at least 123 (11 percent) had developed similar symptoms. The association of _G_. _lamblia_ with the illness, the absence of other pathogens, and the response to treatment suggested that _G_. _lamblia_ was the agent responsible for illness. Approximately half the city's water came from a mountain creek and half from three wells. Chlorinators were provided at each water source, but coliform contamination of the water system was noted intermittently during the 1965-66 ski season. Examination of the creek area revealed no obvious sewage contamination. However, flourescent and detergent tracers placed in the sewage system was detected in two of the three wells, and an engineering evaluation suggested sewage contamination of the wells from leaking sewer mains. _G_. _lamblia_ cysts were isolated from the leaking sewage. A parasitologic survey of Aspen residents showed a difference in prevalence of _G_. _lamblia_ infection betewen the area of the city served by the wells (6.9 percent) and the area served by the creek (3.7 percent). This difference was not statistically significant, and in retrospect it is possible that the creek was also contaminated with *G. lamblia* although this was not sufficiently evaluated at the time. The largest waterborne outbreak of giardiasis occurred in Rome, New York, November 1974 to June 1975; 350 residents had laboratory-confirmed giardiasis and an epidemiologic study estimated 4800-5300 cases of giardiasis.[110] Rome used a surface water source with chlorination as the only treatment. Ammonia and chlorine were added to produce a chloramine for a total combined chlorine residual of 0.8 mg/l. Chloramine requires higher concentrations and longer contact time than free chlorine for effective disinfection. The watershed was sparsley populated, but the presence of human settlements in the watershed suggested that the water supply could have been contaminated by untreated human waste.[111] The bacterial quality of the water source was generally good, but prior to the beginning of the outbreak much higher than normal coliform counts were observed in the untreated water suggesting that contamination entered the system at this time. Outbreaks in Rome, New York, and Bradford, Pennsylvania were responsible for most of the cases of giardiasis in surface water supplies that were disinfected only. An estimated 3500 cases of giardiasis occurred in Bradford[112] during September to December 1979. The first waterborne outbreak of giardiasis involving a filtered water supply occurred in Camas, Washington[113,114] in the spring of 1976 and affected 600 individuals of a population of 6000. Camas used two water sources, mountain streams and deep wells. *Giardia* cysts were isolated from the raw water in two distribution system storage reservoirs. Well water was not found to be contaminated. The watersheds for the surface water sources were well isolated, had no human habitation, and had extremely limited human activity. Several animals on the watershed were trapped and examined for Giardia cysts; three positive beavers were found within foraging distance of the water intakes for Camas. Treatment for the surface water sources consisted of a mixed-media pressure filter and disinfection; no sedimentation was employed prior to filtration. Prior to the outbreak, failure of the chlorination equipment occurred. A number of deficiencies were found in the pressure filters, including ineffective chemical pretreatment. It was reported that the treated water produced by the treatment plant had met both turbidity and coliform standards prior to and during the outbreak. A second outbreak involving a filtered water supply occurred in Berlin, New Hampshire[115-116] in the spring of 1977 and affected 750 of a population of 15,000.

Waterborne outbreaks of giardiasis have occurred primarily in areas that have traditionally depended upon surface water sources free of gross human sewage contamination where water treatment has been minimal and consisted primarily of disinfection without filtration. Attention to maintaining continuous disinfection may not have been as great as in other areas where surface streams are known to be contaminated with human waste discharges. Colorado has reported 19 outbreaks, more than any other state, but this may reflect primarily increased surveillance and investigation. Most of the waterborne outbreaks (67 percent) and most of the cases of giardiasis (52 percent) occurred as the result of consuming untreated surface water or surface water with disinfection as the only treatment (Table 12). Ineffective filtration of surface water was responsible for 12 percent of the outbreaks and 35 percent of disease. Outbreaks have generally occurred in smaller community water systems or noncommunity systems in recreational areas. Studies in Colorado,[117] Minnesota,[118] and Washington[119] have suggested consumption of untreated drinking water to be an important cause of endemic infection in the United States, and a number of single cases of giardiasis have occurred in travelers, campers, and backpackers where a common source could not be investigated. When investigated these cases are often reported in an anecdotal manner and have not been included in this tabulation of waterborne outbreaks. An example of under-reporting of waterborne giardiasis due to lack of investigation and incomplete reporting is provided by Frost and Harter.[119] A follow-up of 883 individual cases of giardiasis routinely reported during 1978 to 1980 in Washington showed that 275 were possibly due to common-source outbreaks: 6 clusters of at least 8 cases involved 70 individuals, and 79 smaller clusters involved a total of 205 cases. None of these 85 clusters of cases had previously been investigated or reported as outbreaks. On follow-up several were felt to be of waterborne origin. There was a cluster of 10 cases where hikers had consumed water from a stream later found to be contaminated with _Giardia_ cysts. Fourteen cases had a common exposure to a work camp where all had consumed water from a stream contaminated with _Giardia_ cysts. There were 11 cases which were exposed to a community water system later shown to have a much higher rate of giardiasis during the period of the 11 cases than a neighboring town with a different water system. Twenty clusters of 43 cases were composed of loggers, game workers, campers, and hikers who drank untreated water while on an outing as a group or during their work.

f. _Acute Chemical Poisonings_

Fifty-two outbreaks and 3775 cases of illness occurred as the result of acute chemical poisonings caused primarily by high concentrations of fluoride, copper, and arsenic in water (Table 13). The outbreaks ranged in size from single cases of infantile methemoglobinemia caused by consumption of high nitrates in well water to a large outbreak of several thousand cases of chlordane poisoning in Pittsburgh in 1980. Most of these outbreaks (54 percent) were caused by contamination of groundwater or contamination through cross-connections (Table 14). Thirteen percent of the chemical-caused outbreaks occurred because of deficiencies in fluoridation practices and 12 percent occurred as the result of corrosive water causing the leaching of metals from plumbing materials. The seven outbreaks of acute fluoride poisoning were caused by improperly designed or malfunctioning fluoridation equipment and operational problems in the addition of fluoride and illustrate the need for improved design of fluoridation equipment and increased surveillance and operator training. Four of these outbreaks occurred at elementary schools adding fluoride to their own water system.

F. Causes of Waterborne Outbreaks and Disease

Contaminated, untreated groundwater was the major cause of waterborne outbreaks (44 percent) for all types of water systems during this sixty-one year period (Figure 48). However, most of the cases of waterborne disease (52 percent), resulted from the inadequate or interrupted treatment of all water sources (Figure 48). In community water systems, most (79 percent) waterborne outbreaks were caused by contaminated, untreated groundwater, deficiencies in water treatment, and contamination of the distribution system (Figure 49). Community systems generally provide some water treatment, especially in the larger metropolitan areas, and the interruption or lack of control of this treatment was responsible for most (57 percent) cases of waterborne disease (Figure 49) and the largest waterborne outbreaks (Table 15). Inadequate filtration and inadequate disinfection in community systems resulted in waterborne outbreaks averaging 2199 illnesses and 1244 illnesses, respectively. Waterborne outbreaks in community water systems using untreated water were smaller: 468 illnesses per outbreak caused by contaminated, untreated well water and 132 illnesses per outbreak caused by contaminated, untreated surface water. In noncommunity and individual water systems, the major cause of both waterborne outbreaks and waterborne disease was the use of contaminated, untreated groundwater (Figures 50, 51). The largest outbreaks in noncommunity systems were caused by cross-connections, backsiphonage, and inadequate disinfection (Table 16). Cross-connections and backsiphonage were responsible for smaller outbreaks in noncommunity systems (203 illnesses per outbreak) than in community systems (538 illnesses per outbreak).

Specific sources of contamination and the water treatment deficiencies responsible for each outbreak were examined and classified (Tables 17-24). There were insufficient data to identify the source of contamination for most of the outbreaks which occurred as the result of using untreated surface water; however, contamination discovered on the watershed after the occurrence of the outbreak, use of contaminated, untreated surface water as a supplemental or emergency source of supply, and sewage overflows near the water intake were the most important causes identified and were responsible for 45 percent of the outbreaks in all water systems. There appeared to be no clear seasonal occurrence of waterborne outbreaks in community water systems caused by contaminated, untreated surface water suggesting that contamination is unrelated to season (Figure 52). In noncommunity water systems, the increased occurrence of outbreaks during the summer may be due to the increased use of these systems by more susceptible individuals traveling and camping as well as increased contamination (Figure 53). The suggestion of a possible increased occurrence of outbreaks in individual surface water systems during the summer may be due to increased use of mountain streams by hikers and campers (Figure 54).

The overflow or seepage of sewage and surface runoff were responsible for 40 percent of the waterborne outbreaks which occurred as the result of using untreated springs; there was insufficient data to determine the source of contamination of springs in approximately half of the outbreaks (Table 18). A distinct seasonal occurrence was noted for outbreaks caused by contamination of untreated springs, and most of these occurred during June through September (Figure 55).

A source of contamination was identified in 76 percent of the waterborne outbreaks caused by contamination of untreated well water (Table 19). The overflow or seepage of sewage into wells caused 35 percent of the outbreaks; surface runoff from heavy rains or flooding caused 21 percent of the outbreaks; and contamination of wells through creviced limestone or fissured rock caused 8 percent of the outbreaks. Other sources of contamination of wells included chemicals, contaminated surface water from streams or rivers, seepage from abondoned wells, and animals entering the well. Outbreaks in community systems using contaminated, untreated well water occurred primarily in July, August, and September, outbreaks in noncommunity systems occurred primarily in June, July, and August, and outbreaks in individual systems occurred primarily in June, July, August, and September (Figures 56-58). During the sixty-one year period, an etiologic agent was identified in 56 percent of the outbreaks caused by the contamination of untreated well water (Figure 59). Most of the outbreaks in untreated well water systems where an etiology was identified were caused by S. typi, Shigella, and hepatitis A. Examination of the etiologies over the most recent ten-year period shows chemicals, shigella and hepatitis A to be the most important etiologic agents of outbreaks in untreated well water systems (Figure 60).

Twenty waterborne outbreaks occurred after an unexpected heavy contamination completely overwhelmed the normal disinfection required (Table 20). In most of these outbreaks contamination was caused by the overflow or seepage of sewage. Inadequate disinfection resulted in 108 waterborne outbreaks, and 102 outbreaks were caused by interrupted disinfection (Table 21). In groundwater systems the interruption of disinfection was a more important cause of outbreaks than was inadequate disinfection. In surface water systems inadequate disinfection caused more outbreaks than interrupted disinfection. Inadequate control of filtration and allied treatment was responsible for only 14 percent of the outbreaks caused by inadequate treatment but was responsible for 51 percent of the cases of illness. A seasonal occurrence of outbreaks caused by treatment deficiencies was apparent in noncommunity water systems but not in community water systems (Figures 61, 62). No seasonal occurrence was noted for outbreaks in filtered water systems (Figure 63). Waterborne outbreaks in surface water systems and well water systems treated only by disinfection occurred primarily in July, but no similar occurrence was apparent for outbreaks in systems using springs treated only by disinfetion (Figures 64-66).

Cross-connections and backsiphonage were responsible for most (78 percent) outbreaks and disease (95 percent) caused by distribution system contamination (Table 22). Outbreaks caused by cross-connections and backsiphonage appeared to occur primarily during June through October (Figure 67). Most of the outbreaks (49 percent) and diseases (81 percent) caused by cross-connections and backsiphonage were gastroenteritis of unidentified etiology (Table 23); 26 percent were of typhoid fever and 10 percent were outbreaks of chemical poisoning.

Contamination of distribution reservoirs in community water systems was responsible for most outbreaks and disease caused by contamination of water storage facilities (Table 24). Waterborne outbreaks were caused by several miscellaneous reasons including insufficient data available for classifying the cause, use of water not intended for drinking, contaminated ice, buckets, hoses, tank truck, and drinking fountain, and deliberate contamination with chemicals (Table 25).

There were 178 waterborne outbreaks in water systems serving parks, campgrounds, and recreational areas (Table 26), 149 outbreaks in water systems serving hotels, motels, and rooming houses (Table 27), 85 outbreaks in water systems serving industrial facilities (Table 28) and 77 outbreaks in water systems serving schools (Table 29). In water systems serving visitors and travelers to parks, campgrounds, recreational areas, hotels, motels, and rooming houses, outbreaks were caused primarily by contamination of untreated well water (43 percent) and inadequate or interrupted disinfection (21 percent). Outbreaks in these water systems showed a distinct seasonal variation with most outbreaks occurring in July (Figures 68, 69). Cross-connections or backsiphonage (45 perecnt) and contamination of untreated well water (24 percent) caused most outbreaks at industrial facilities. Outbreaks at schools occurred primarily because of contaminated untreated well water (40 percent) and cross-connections or backsiphonage (16 percent). No clear seasonal distribution was observed for waterborne outbreaks in industrial facilities (Figures 70). Most waterborne outbreaks in schools occurred at the beginning of the school season in September and October (Figure 71). An increased number of outbreaks also occurred toward the end of the school season in April and May.

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TABLE 1

Growth of Community Water Systems in the United States

1800-1958[22-26]

Year	Number of Water Facilities	Number of Purificaiton Facilities	Number of Disinfection Facilities
1800	16		
1850	83		
1870	243		
1880	598	1	
1890	1,878	–[a]	
1896	3,196	–[a]	
1924	9,850	638	–[a]
1930	–[a]	1,531	2,917
1934	10,790	–[a]	–[a]
1938	12,760	–[a]	4,054
1940	–[a]	1,855	4,590
1948	–[a]	2,054	6,137
1958	17,808	2,517	8,845

[a] not available

TABLE 2

U.S. Population Served by Sand Filtration

1800-1958[22-26]

Year	Slow Sand Filtration (population)	Rapid Sand Filtration (population)	Percent of Urban Population Served by Filtered Water
1870	0	0	0
1880	30,000	0	<1
1890	35,000	275,000	2
1900	360,000	1,500,000	6
1904	560,000	2,600,000	10
1910	3,883,000	6,922,000	28
1914	5,398,000	11,893,000	36
1924	5,054,000	18,610,000	38
1940	3,579,200	26,751,700	41
1948	2,014,635	39,731,460	47
1958	3,177,380	55,606,245	48

TABLE 3

Water Treatment in the United States

1930-1958[23-26]

Year	Communities with Water Systems	Surface Water Facilities[a]	Facilities with Rapid & Slow Sand Purification[a]	Facilities with Disinfection[a]	Population Served by Community Water Systems	Population Served by Filtered or Disinfected Water[b]	Population Served by Treated Surface Water[b]
1930	11,000[c]	–[d]	14%	27%	–[d]	–[d]	–[d]
1938-40	13,293	26%	16%	31%	131,669,275	67%	35%
1943	16,747	30%	12%	37%	150,697,361	83%	33%
1958	20,459	27%	12%	43%	179,323,175	83%	42%

[a] Number of facilities divided by number of communities with a water system.

[b] Population served by treated water divided by total population served by community water systems.

[c] Estimated from 1924, 1934, and 1938 data.

[d] Not available.

TABLE 4

Proportion[a] of Waterborne Outbreaks in States Reporting The Most Waterborne Outbreaks During the Period 1920-80

	Time Period						
State	1920-30	1931-40	1941-50	1951-60	1961-70	1971-80	1920-80
California	4.7	2.9	3.5	12.6	9.9	6.6	5.6
Oregon	1.2	-0-	2.2	2.7	7.6	5.0	2.8
Washington	1.6	1.1	1.0	1.8	1.5	4.4	2.0
Colorado	-0-	0.3	-0-	3.6	4.6	6.9	2.3
Illinois	5.1	3.2	3.2	7.1	3.1	1.3	3.4
Indiana	3.9	10.2	4.2	1.0	1.0	1.0	4.0
Ohio	3.5	2.2	3.8	7.2	4.6	2.8	3.6
Maryland	8.2	2.6	3.5	-0-	2.3	1.9	3.4
Pennsylvania	13.3	9.5	2.9	1.8	2.3	20.0	9.8
New York	7.8	27.3	46.0	20.7	3.8	3.8	19.9
Massachusetts	0.8	6.5	1.6	0.9	1.5	1.3	2.3
TOTAL	50.2	65.8	71.9	59.5	42.0	54.7	55.4
U.S.	100	100	100	100	100	100	100

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[a] $\left(\frac{\text{Number of Outbreaks Reported by State during Period}}{\text{Number of Outbreaks Reported for U.S. during Period}} \right) \times 100$

TABLE 5

Comparison[a] of Reported and Expected[b] Waterborne Outbreaks in States Reporting the Most Waterborne Ourbreaks During the Period 1920-80

State	Time Period					
	1920-30	1931-40	1941-50	1951-60	1961-70	1971-80
California	0.8	0.5	0.6	2.3*	1.8*	1.2
Oregon	0.4	-0-	0.8	1.0	2.7*	1.8*
Washington	1.6*	0.9	0.7	1.5*	1.8*	4.0*
Colorado	-0-	0.2	-0-	2.6*	4.7*	5.5*
Illinois	1.5*	0.9	0.9	2.1*	0.9	0.4
Indiana	1.0	2.6*	1.0	0.3	0.3	0.3
Ohio	1.0	0.6	1.1	2.0*	1.3	0.8
Maryland	2.4*	0.8	1.0	-0-	0.7	0.6
Pennsylvania	1.4*	1.0	0.3	0.2	0.2	2.1*
New York	0.4	1.4*	2.3*	1.1	0.2	0.2
Massachusetts	0.7	4.3*	1.0	0.7	1.6*	1.0

[a] Observed divided by Expected

[b] Expected number of waterborne outbreaks based on total number of waterborne outbreaks observed in each state and the total number of waterborne outbreaks observed in the United States for a given time period.

* Reporting 40% more outbreaks than expected.

TABLE 6

Magnitude of Waterborne Outbreaks

1920-80

	Frequency of Occurrence (Number of Outbreaks)			
Size of Outbreak (Cases of Illness)	Community Systems	Noncommunity Systems	Individual Systems	All Systems
< 2	3	0	3	6
2 - 5	26	35	95	156
6 - 10	71	50	81	202
11 - 25	145	119	63	327
26 - 50	94	124	34	252
51 - 100	68	82	16	166
101 - 200	63	50	6	119
201 - 300	28	14	2	44
301 - 500	29	14	1	44
501 - 1000	29	9	1	39
1001 - 3000	28	3	0	31
3001 - 5000	9	0	0	9
5001 - 10,000	5	0	0	5
> 10,000	5	0	0	5
	603	500	302	1,405

TABLE 7

Deaths from Various Causes in Waterborne Outbreaks

1920-80

Disease	Time Period					
	1920-30	1931-40	1941-50	1951-60	1961-70	1971-80
Typhoid Fever	669	220	51	3	-	-
Shigellosis	-	-	7	1	4	2
Amebiasis	-	98	-	2	2	-
Chemical Poisoning	-	-	-	4	6	1
Gastroenteritis	-	2	3	-	-	-
Toxeginic *E. coli* Diarrhea	-	-	-	-	4	-
Hepatitis A	-	-	-	-	1	-
Salmonellosis	-	-	-	-	3	-

TABLE 8

Deaths Associated with Waterborne Outbreaks in the United States

1920-80

Disease	Type of Water Supply			
	Community	Noncommunity	Individual	All
Typhoid Fever	654	87	202	943
Amebiasis	99	2	1	102
Shigellosis	3	3	8	14
Chemical Poisoning	2	0	9	11
Gastroenteritis	3	0	2	5
Toxigenic *E. coli* Diarrhea	3	0	1	4
Salmonellosis	3	0	0	3
Hepatitis A	0	0	1	1
TOTAL	767	92	224	1,083

TABLE 9

Mean Number of Deaths Occurring in Waterborne Outbreaks

1920-80

Type Water Supply	Mean Number of Deaths in Outbreaks Where a Death Occurred	
	Typhoid	Other
Community	5.2	10.3
Noncommunity	3.3	1.7
Individual	3.6	1.8
All	4.6	4.6

TABLE 10
Etiology of Waterborne Outbreaks
1920-80

Time Period	Disease	Outbreaks	Cases	Deaths
1920-25	Typhoid Fever	127	7,294	435
	Gastroenteritis	11	27,756	0
1926-30	Typhoid Fever	100	3,072	234
	Gastroenteritis	17	63,902	0
1931-35	Typhoid Fever	85	2,114	140
	Gastroenteritis	25	7,664	0
	Amebiasis	1	1,412	98
	Hepatitis A	1	28	0
1936-40	Gastroenteritis	91	77,403	2
	Typhoid Fever	60	1,281	80
	Shigellosis	10	3,308	0
	Chemical Poisoning	1	92	0
	Amebiasis	1	4	0
1941-45	Gastroenteritis	126	36,118	3
	Typhoid Fever	56	1,450	46
	Shigellosis	10	2,817	6
	Salmonellosis	1	12	0
	Para-Typhoid Fever	2	14	0
	Chemical Poisoning	1	30	0
1946-50	Gastroenteritis	87	10,718	0
	Typhoid Fever	18	264	5
	Hepatitis A	5	173	0
	Shigellosis	4	2,321	1
	Para-Typhoid Fever	1	5	0
	Leptospirosis	1	9	0
	Tularemia	1	4	0
1951-55	Gastroenteritis	31	5,297	0
	Typhoid Fever	7	103	0
	Hepatitis A	7	340	0
	Shigellosis	4	732	1
	Amebiasis	1	31	2
	Salmonellosis	1	2	0
	Poliomyelitis	1	16	0
1956-60	Gastroenteritis	21	2,306	0
	Typhoid Fever	13	128	3
	Hepatitis A	11	417	0
	Shigellosis	7	3,081	0
	Chemical Poisoning	3	14	4
	Salmonellosis	2	17	0
	Amebiasis	1	5	0
	Tularemia	1	2	0

Craun 80

TABLE 10 (Continued)

Etiology of Waterborne Outbreaks

1920-80

Time Period	Disease	Outbreaks	Cases	Deaths
1961-65	Gastroenteritis	18	20,627	0
	Typhoid Fever	11	63	0
	Hepatitis A	10	334	0
	Shigellosis	7	520	4
	Chemical Poisoning	5	30	6
	Salmonellosis	3	16,425	3
	Giardiasis	1	123	0
	Para-Typhoid Fever	1	5	0
1966-70	Gastroenteritis	21	5,922	0
	Hepatitis A	19	562	1
	Shigellosis	14	1,215	0
	Typhoid Fever	4	45	0
	Salmonellosis	4	226	0
	Toxigenic *E. coli* AGI	4	188	4
	Chemical Poisoning	4	15	0
	Amebiasis	3	39	2
	Giardiasis	2	53	0
1971-75	Gastroenteritis	63	17,752	0
	Shigellosis	14	2,803	2
	Hepatitis A	14	368	0
	Giardiasis	13	5,136	0
	Chemical Poisoning	13	513	0
	Typhoid Fever	4	222	0
	Salmonellosis	2	37	0
	Toxigenic *E. coli* AGI	1	1,000	0
1976-80	Gastroenteritis	114	22,093	0
	Giardiasis	26	14,416	0
	Chemical Poisoning	25	3,081	1
	Shigellosis	10	2,392	0
	Viral Gastroenteritis	10	3,147	0
	Salmonellosis	6	1,113	0
	Campylobacterosis	3	3,821	0
	Hepatitis A	2	95	0

TABLE 11

Shigella Isolates from Waterborne Outbreaks

1936-80

	Outbreaks		Cases of Illness	
Shigella Isolate	1936-60	1961-80	1936-60	1961-80
S. sonnei	12	25	2,294	5,593
S. flexneri	15	10	7,006	414
Unidentified/Other	8	10	2,959	923
TOTAL	35	45	12,259	6,930

TABLE 12

Water System Deficiencies Responsible for Waterborne Giardiasis Outbreaks 1965-80

	Number of Outbreaks			
Cause	Community Water System	Noncommunity Water System	Individual Water System	All Systems
1. Inadequate/interrupted disinfection of surface water (when only treatment)	13	5	-	18
2. Untreated surface water	1	5	4	10
3. Ineffective filtration	5	-	-	5
4. Cross-connection	2	1	-	3
5. Untreated ground water	1	1	-	2
6. Interrupted disinfection of spring or well	2	-	-	2
7. Other	-	1	1	2
TOTAL	24	13	5	42

TABLE 13

Chemicals Responsible for Multiple Outbreaks of Waterborne Disease

1936-80

Chemical	Outbreaks	Illnesses
Fluoride	7	633
Copper	7	106
Arsenic	6	37
Petroleum products	5	111
Chlordane	4	2,043
Unidentified pesticides	4	22
Chromates	2	31
Selenium	2	7
Herbicides	2	5
Nitrate	2	2

TABLE 14

Causes of Chemical Poisonings

1936-80

Cause of Outbreak	Outbreaks
Contamination of groundwater	14
Cross-connection, backsiphonage	14
Deficiencies in fluoridation practices	7
Leaching of metals from plumbing	6
Deliberate contamination	3
Deficiencies in chemical feed	2
Contamination of storage container	2
Contamination of distribution storage facility	1
Contamination of pipe with cutting oil	1
Contaminated bottled water	1
Insufficient data	1

TABLE 15

Magnitude of Waterborne Outbreaks in Community Water Systems

1920-80

Deficiency	Illness per Outbreak
1. Inadequate filtration	2199
2. Inadequate disinfection when only treatment	1244
3. Cross-connection, backsiphonage	538
4. No treatment of well water	468
5. Contaminated storage facility	464
6. Interrupted disinfection when only treatment	256
7. No treatment of surface water	132
8. Contaminated mains, service lines, plumbing	104
9. No treatment of spring water	47

TABLE 16

Magnitude of Waterborne Outbreaks in Noncommunity Water Systems

1920-80

Deficiency	Illness per Outbreak
1. Cross-connection, backsiphonage	203
2. Inadequate disinfection when only treatment	168
3. Interrupted disinfection when only treatment	85
4. No treatment of spring water	77
5. No treatment of well water	75
6. Contaminated storage facility	45
7. No treatment of surface water	31

TABLE 17

Waterborne Outbreaks Caused by Use of Contaminated, Untreated Surface Water

1920-80

	Type of Water System							
	Community		Non-Community		Individual		All	
Deficiency	OB[a]	Cases	OB[a]	Cases	OB[a]	Cases	OB[a]	Cases
1. Contamination on watershed	26	3,498	3	57	12	257	41	3,812
2. Use of surface water for supplemental source	7	3,613	7	245	2	115	16	3,973
3. Overflow of sewage or outfall near water intake	3	103	3	39	5	87	11	229
4. Flooding, heavy rains	2	125	1	93	1	77	4	295
5. Dead animals in reservoir	-	-	1	100	-	-	1	100
6. Insufficient data	27	1,228	24	726	28	436	79	2,390
TOTAL	65	8,567	39	1,260	48	972	152	10,799

[a] Number of Outbreaks

TABLE 18

Waterborne Outbreaks Caused by Use of Contaminated, Untreated Groundwater (Springs)

1920-80

	Type of Water System							
Deficiency	Community OB[a]	Community Cases	Non-Community OB[a]	Non-Community Cases	Individual OB[a]	Individual Cases	All OB[a]	All Cases
1. Overflow or seepage of sewage	8	238	3	35	5	39	16	312
2. Surface runoff	11	265	5	162	7	75	23	502
3. Flooding	2	76	2	123	-	-	4	199
4. Creviced limestone	1	200	3	213	-	-	4	413
5. Contamination of raw water transmission line	2	284	1	7	-	-	3	291
6. Improper construction	-	-	1	26	1	9	2	35
7. Insufficient data	12	508	18	1,961	20	415	50	2,884
TOTAL	36	1,571	33	2,527	33	538	102	4,636

[a] Number of Outbreaks

TABLE 19

Waterborne Outbreaks Caused by Use of Contaminated, Untreated Groundwater (Wells)

1920-80

	Type of Water System							
	Community		Non-Community		Individual		All	
Deficiency	OB[a]	Cases	OB[a]	Cases	OB[a]	Cases	OB[a]	Cases
1. Overflow or seepage of sewage	28	14,915	104	10,236	52	675	184	25,826
2. Surface runoff, heavy rains	25	2,492	26	947	34	824	85	4,263
3. Creviced limestone, fissured rock	9	1,404	19	2,044	12	660	40	4,108
4. Improper construction, faulty well casing	8	342	10	414	9	141	27	897
5. Flooding	9	5,883	3	107	5	211	17	6,201
6. Chemical contamination	3	77	2	16	10	68	15	161
7. Contamination by stream or river	3	445	6	392	3	48	12	885
8. Contamination of raw water transmission line	8	10,481	-	-	-	-	8	10,481
9. Seepage from abandoned well	3	144	1	50	-	-	4	194
10. Animal in well	1	34	1	238	2	19	4	291
11. Insufficient data	19	18,480	67	3,309	40	413	126	22,202
TOTAL	116	54,697	239	17,753	167	3,059	522	75,509

[a] Number of Outbreaks

TABLE 20

Waterborne Outbreaks Caused by Source Contamination Sufficient to Overwhelm Normal Disinfection

1920-80

	Type of Water System							
	Community		Non-Community		Individual		All	
Deficiency	OB[a]	Cases	OB[a]	Cases	OB[a]	Cases	OB[a]	Cases
1. Overflow or seepage of sewage								
A. Wells	4	16,373	3	137	-	-	7	16,510
B. Springs	-	-	4	1,287	-	-	4	1,287
C. Surface water	3	31,990	1	211	-	-	4	32,201
2. Heavy rains, surface runoff	3	1,215	1	33	-	-	4	1,248
3. Contamination of raw water transmission line	-	-	1	37	-	-	1	37
TOTAL	10	49,578	10	1,705	-	-	20	51,283

[a] Number of Outbreaks

TABLE 21

Waterborne Outbreaks Caused by Inadequate Treatment

1920-80

	Type of Water System							
	Community		Non-Community		Individual		All	
Deficiency	OB[a]	Cases	OB[a]	Cases	OB[a]	Cases	OB[a]	Cases
1. Inadequate disinfection when only treatment:								
A. Surface waters	40	22,087	19	2,684	2	37	61	24,808
B. Wells	11	13,518	17	1,795	1	13	29	15,326
C. Springs	5	367	2	60	-	-	7	427
D. Mixed	4	293	-	-	-	-	4	293
E. Unknown source	3	4969	-	-	-	-	3	4,969
2. Interruption of disinfection when only treatment:								
A. Surface waters	26	2,173	12	1,495	-	-	38	3,668
B. Wells	16	6,148	29	2,239	-	-	45	8,387
C. Springs	7	4,672	4	153	1	3	12	4,828
D. Mixed	-	-	1	40	-	-	1	40
E. Unknown source	2	42	-	-	-	-	2	42
3. Inadequate disinfection with other treatment	3	1751	1	7	-	-	4	1,758
4. Interruption of disinfection with other treatment	7	8,689	1	26	-	-	8	8,715
5. Inadequate control of filtration and allied treatment	35	76,953	1	100	1	9	37	77,062
6. Inadequate control of chemical feed	4	92	5	608	-	-	9	700
TOTAL	163	141,754	92	9,207	5	62	260	151,023

[a] Number of Outbreaks

TABLE 22

Waterborne Outbreaks Caused by Contamination of Distribution System 1920-80

Deficiency	Type of Water System Community		Non-Community		Individual		All	
	OB[a]	Cases	OB[a]	Cases	OB[a]	Cases	OB[a]	Cases
1. Cross-connection	89	57,061	18	4,755	-	-	107	61,816
2. Backsiphonage	28	5,930	9	714	1	5	38	6,649
3. Contamination of mains during construction, repair, flushing	9	2,055	2	23	-	-	11	2,078
4. Contamination of mains when broken or leaking	10	983	1	27	-	-	11	1,010
5. Contamination or corrosion of household plumbing or service lines	6	69	2	134	1	2	9	205
6. Corrosion due to CO_2 in soft drink machine or in water coolers	3	84	-	-	-	-	3	84
7. Water main and sewer in same trench or inadequately separated	3	131	2	71	-	-	5	202
8. Improper/no disinfection of water main, household plumbing	3	210	-	-	-	-	3	210
TOTAL	151	66,523	34	5,724	2	7	187	72,254

[a] Number of Outbreaks

TABLE 23

Etiology of Waterborne Outbreaks Caused by Cross-Connections, Backsiphonage

1920-80

Disease	Outbreaks	Illnesses
Gastroenteritis	71	55,069
Typhoid fever	37	2,637
Chemical poisoning	14	618
Hepatitis A	8	320
Shigellosis	6	3,367
Giardiasis	3	2,209
Viral gastroenteritis	2	1,967
Salmonellosis	2	1,425
Other	2	853
TOTAL	145	68,465

TABLE 24

Waterborne Outbreaks Caused by Contamination of Storage Facilities

1920-80

	Type of Water System							
	Community		Non-Community		Individual		All	
Deficiency	OB[a]	Cases	OB[a]	Cases	OB[a]	Cases	OB[a]	Cases
1. Contamination of distribution storage facility	11	7,552	3	45	-	-	14	7,597
2. Contamination of cistern	2	69	3	126	3	24	8	219
3. Contamination of storage tank	2	196	3	175	-	-	5	371
4. Improper/no disinfection of new or repaired storage facility	1	58	1	101	-	-	2	159
5. Insufficient data	1	13	-	-	-	-	1	13
TOTAL	17	7,888	10	447	3	24	30	8,359

[a] Number of Outbreaks

TABLE 25

Waterborne Outbreaks Caused by Miscellaneous Reasons

1920-80

	Type of Water System							
	Community		Non-Community		Individual		All	
Deficiency	OB[a]	Cases	OB[a]	Cases	OB[a]	Cases	OB[a]	Cases
1. Use of water not intended for drinking	2	12	14	1023	6	263	22	1,298
2. Contaminated ice	2	18	2	30	3	1,060	7	1,108
3. Contaminated buckets, hoses, tank truck	1	9	1	11	4	89	6	109
4. Contaminated drinking fountain	2	72	2	25	-	-	4	97
5. Ingestion of water while swimming	-	-	-	-	4	70	4	70
6. Deliberate contamination with chemicals	1	2,000	-	-	2	18	3	2,018
7. Contaminated bottled water	-	-	2	32	1	3	3	35
8. Faulty distilling devices	-	-	1	14	-	-	1	14
9. Insufficient data	37	4,665	21	2,331	24	536	82	7,532
TOTAL	45	6,776	43	3,466	44	2,039	132	12,281

[a] Number of Outbreaks

TABLE 26

Cause of Outbreaks in Water Systems for Parks, Campgrounds, Recreation Areas

1920-80

Cause	Outbreaks
Contaminated, untreated well water	61
Inadequate, interrupted disinfection	46
Contaminated, untreated surface water	24
Contaminated, untreated spring water	17
Cross-connections, backsiphonage	11
Contaminated storage facilities	3
Miscellaneous, insufficient data	16
	178

TABLE 27

Cause of Outbreaks in Water Systems Serving Hotels, Motels, Rooming Houses

1920-80

Cause	Outbreaks
Contaminated, untreated well water	80
Inadequate, interrupted disinfection	24
Contaminated, untreated surface water	15
Cross connection, backsiphonage	10
Contaminated, untreated spring water	8
Miscellaneous, insufficient data	12
	149

TABLE 28

Cause of Outbreaks in Water Systems for Industrial Facilities

1920-80

Cause	Outbreaks
Cross-connection, backsiphonage	38
Contaminated, untreated groundwater	20
Contaminated, untreated surface water	9
Contaminated mains, survice lines, plumbing	5
Use of water not intended for drinking	4
Treatment deficiencies	3
Contaminated storage	2
Other	4
	85

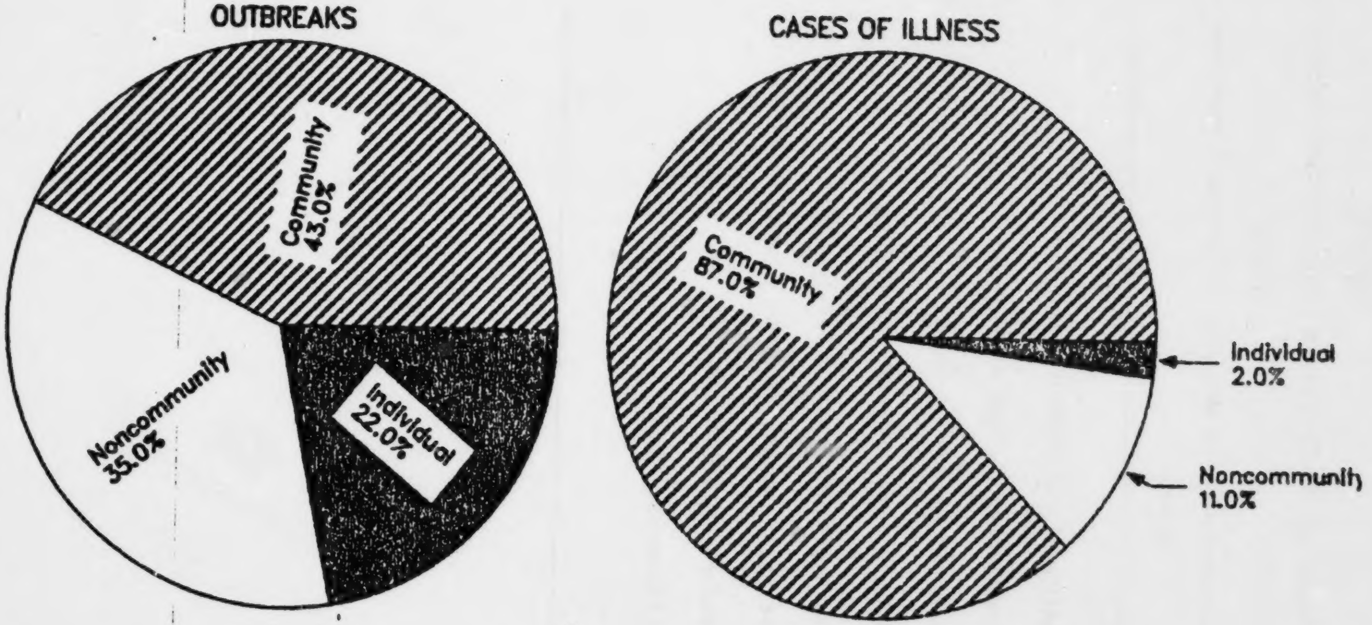
TABLE 29

Cause of Outbreaks in Water Systems Serving Schools

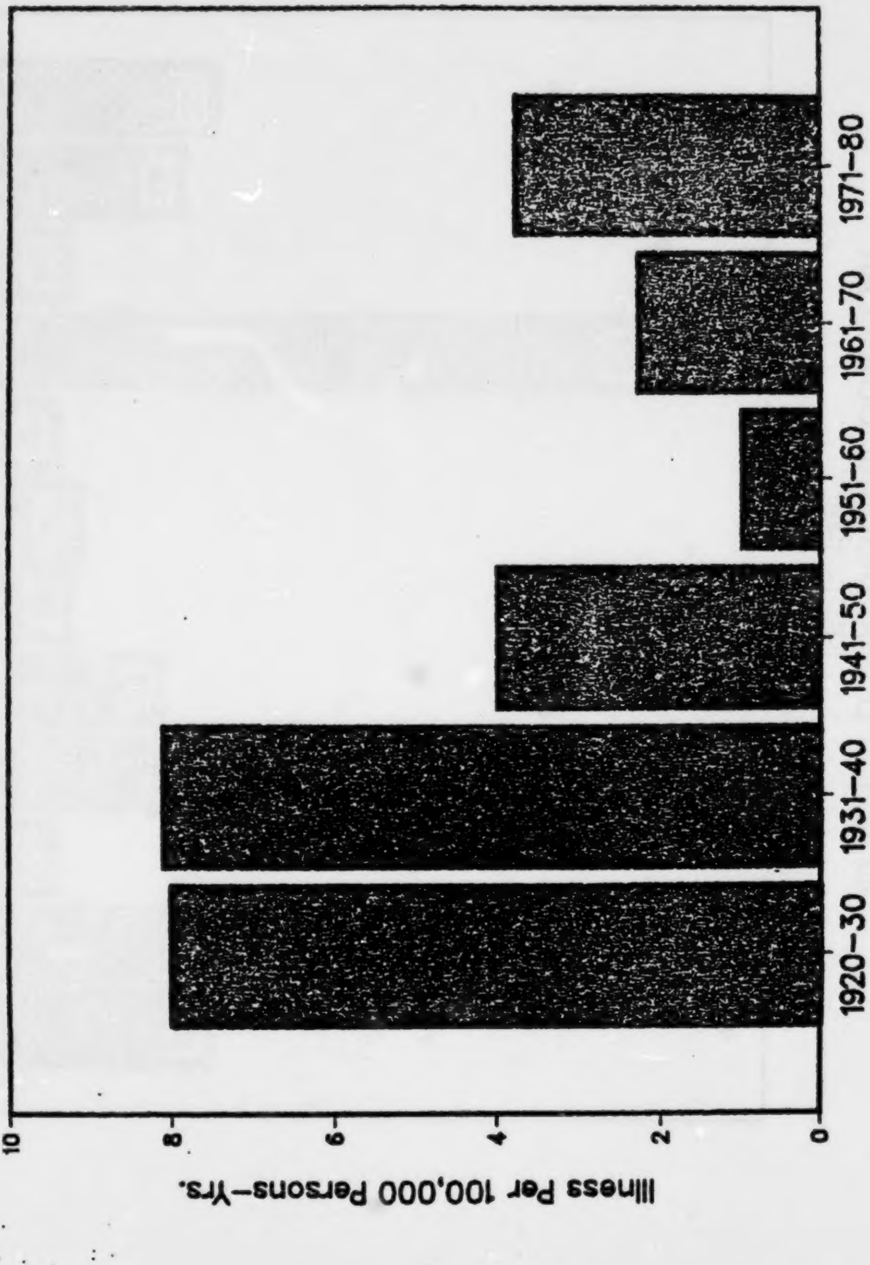
1920-80

Cause	Outbreaks
Contaminated, untreated well water	31
Cross-conncetion, backsiphonage	12
Inadequate control of chemical feed or filtration	7
Inadequate, interrupted disinfection	6
Contaminated, untreated spring water	4
Contaminated mains, service lines, plumbing	4
Contaminated storage facilities	3
Miscellaneous, insufficient data	10
	77

WATERBORNE OUTBREAKS
BY TYPE OF SYSTEM
1920–1980

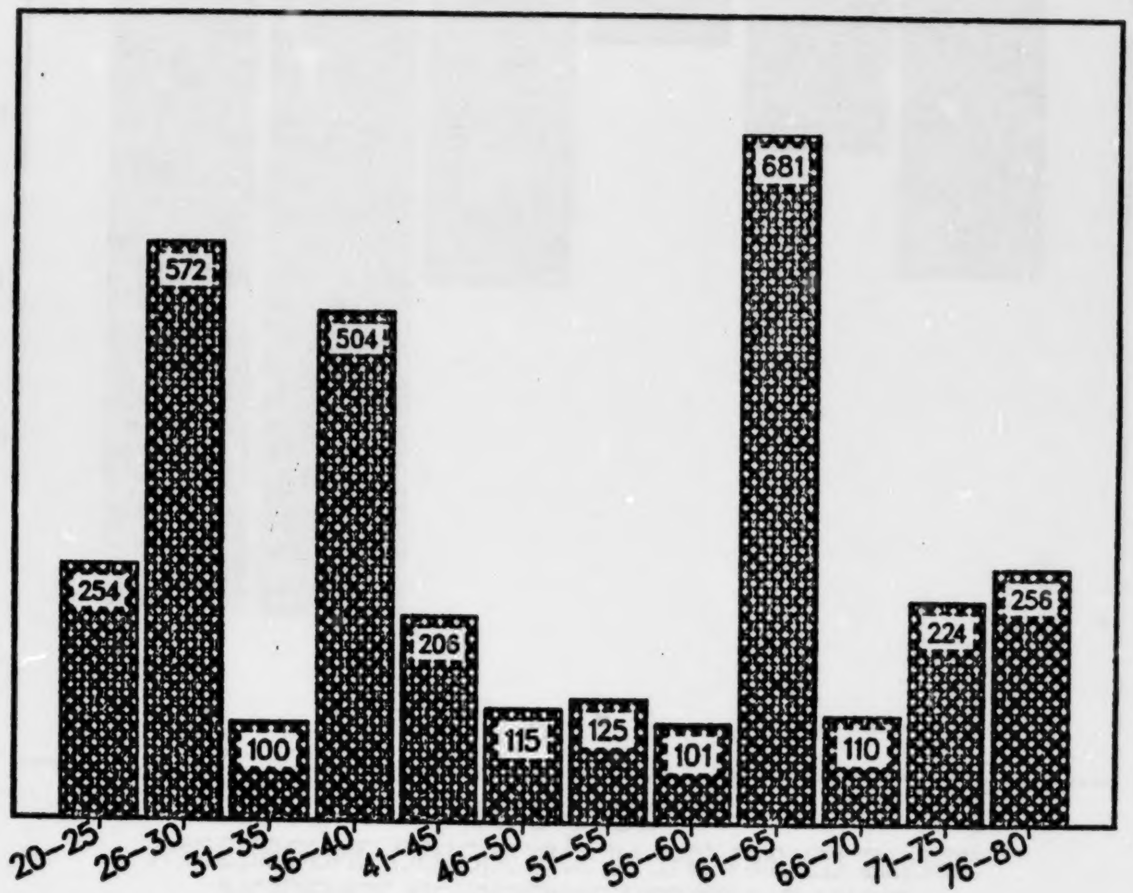


INCIDENCE OF DISEASE RESULTING FROM WATERBORNE OUTBREAKS IN THE UNITED STATES 1920–1980



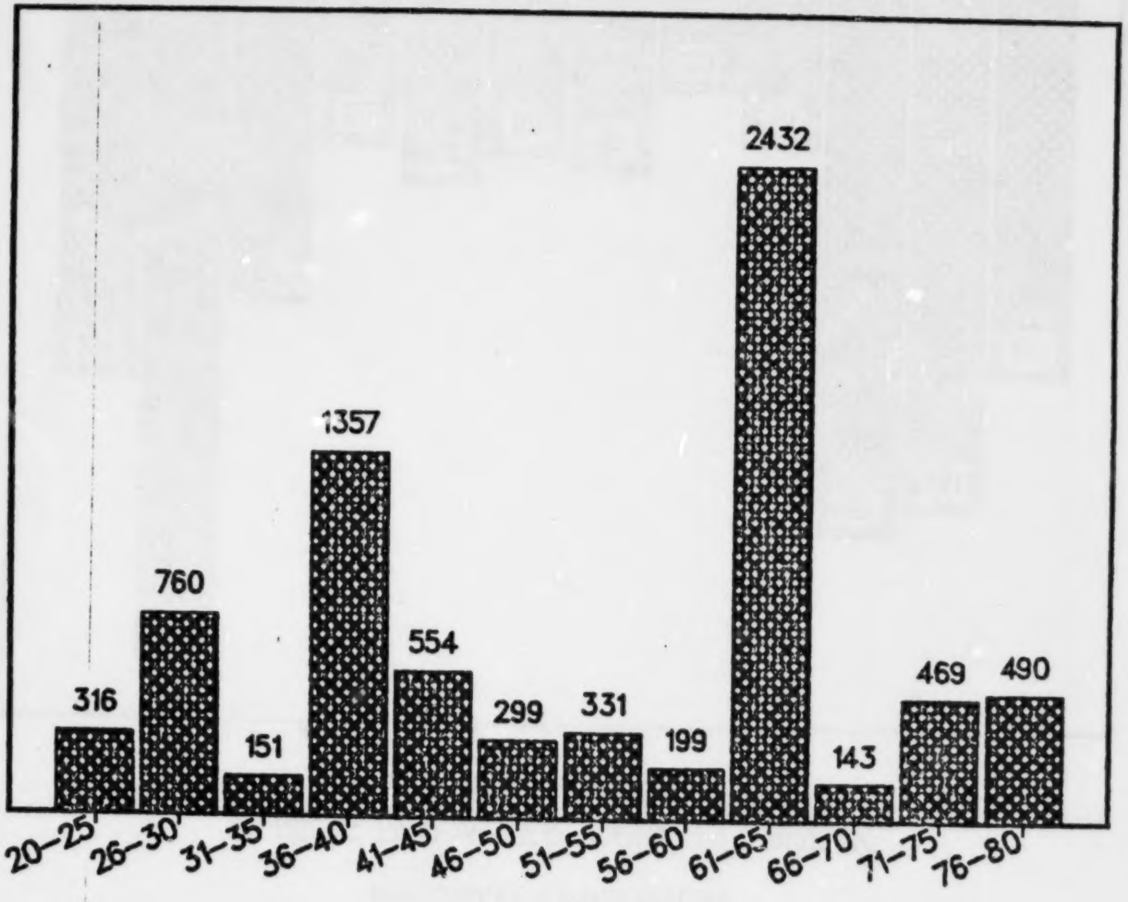
ALL WATER SYSTEMS

ILLNESS PER WATERBORNE OUTBREAK
1920–1980



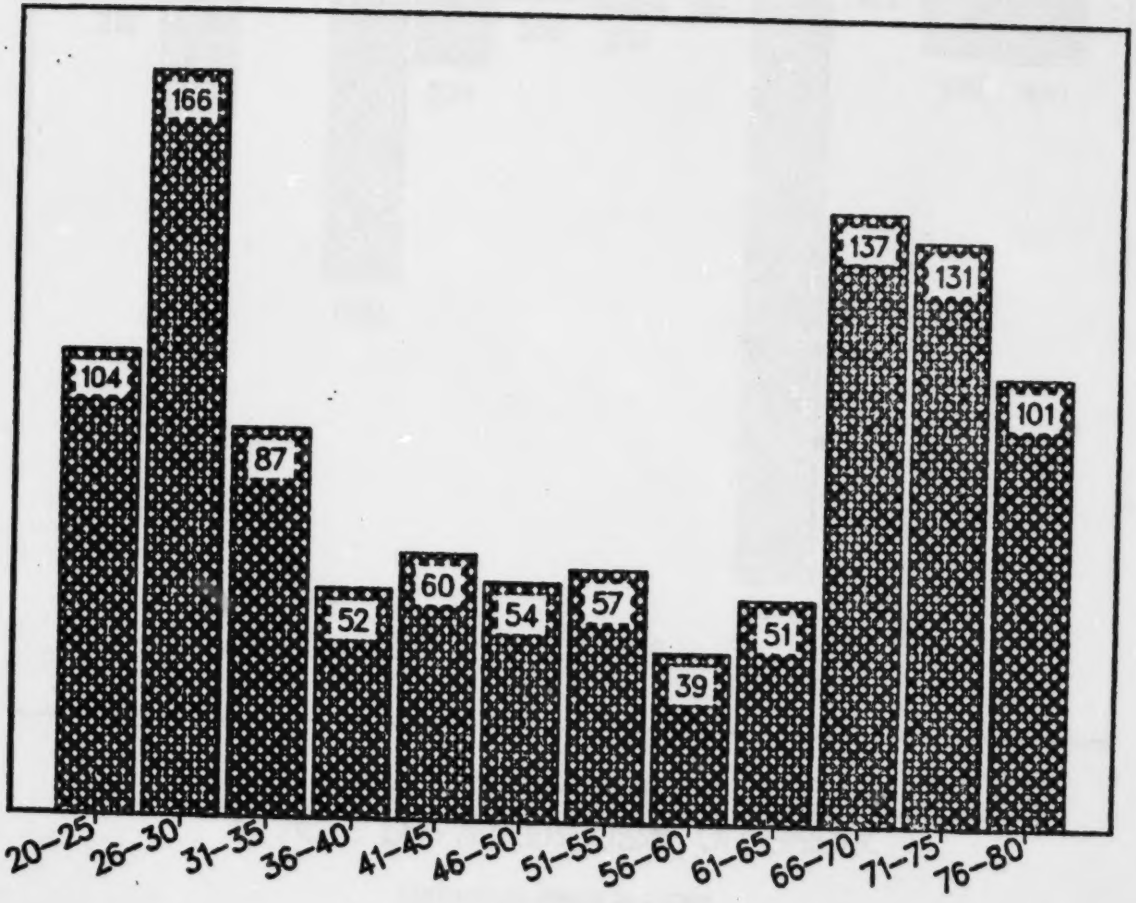
COMMUNITY WATER SYSTEMS

ILLNESS PER WATERBORNE OUTBREAK
1920–1980



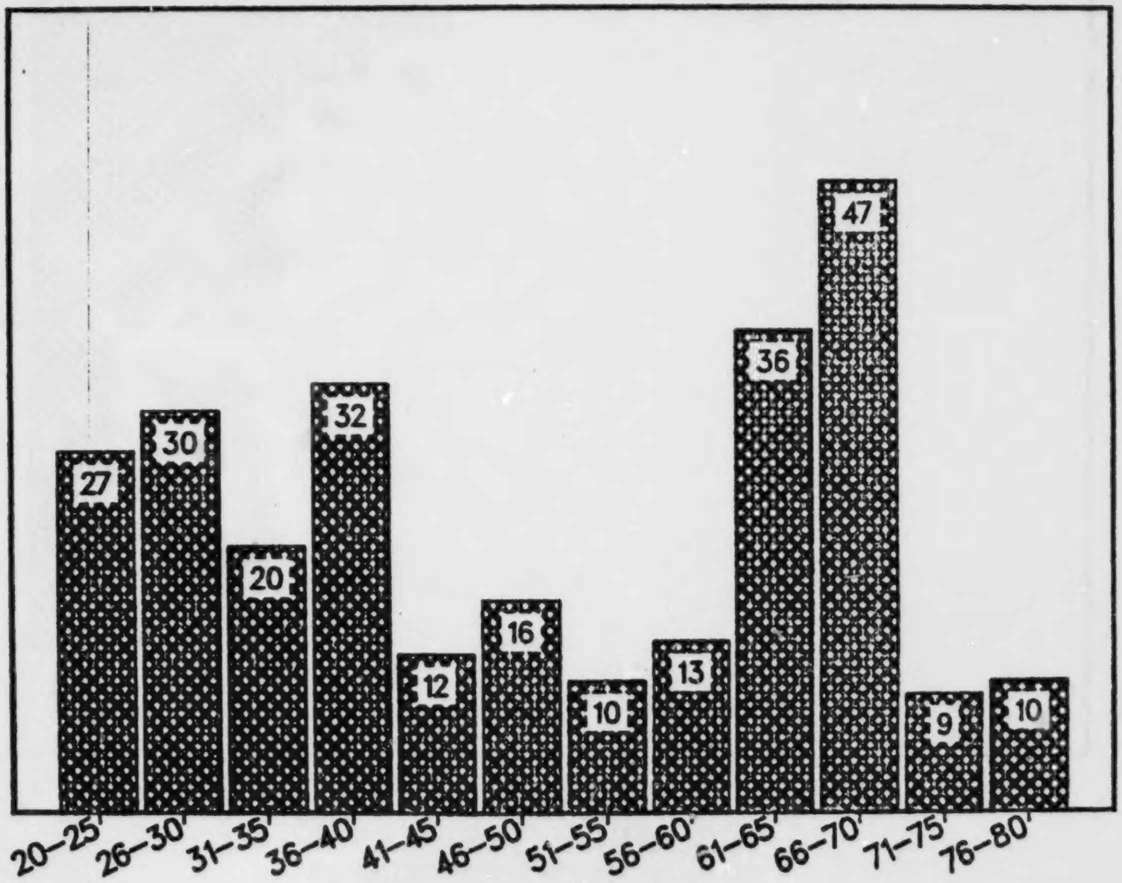
NONCOMMUNITY WATER SYSTEMS

ILLNESS PER WATERBORNE OUTBREAK
1920–1980

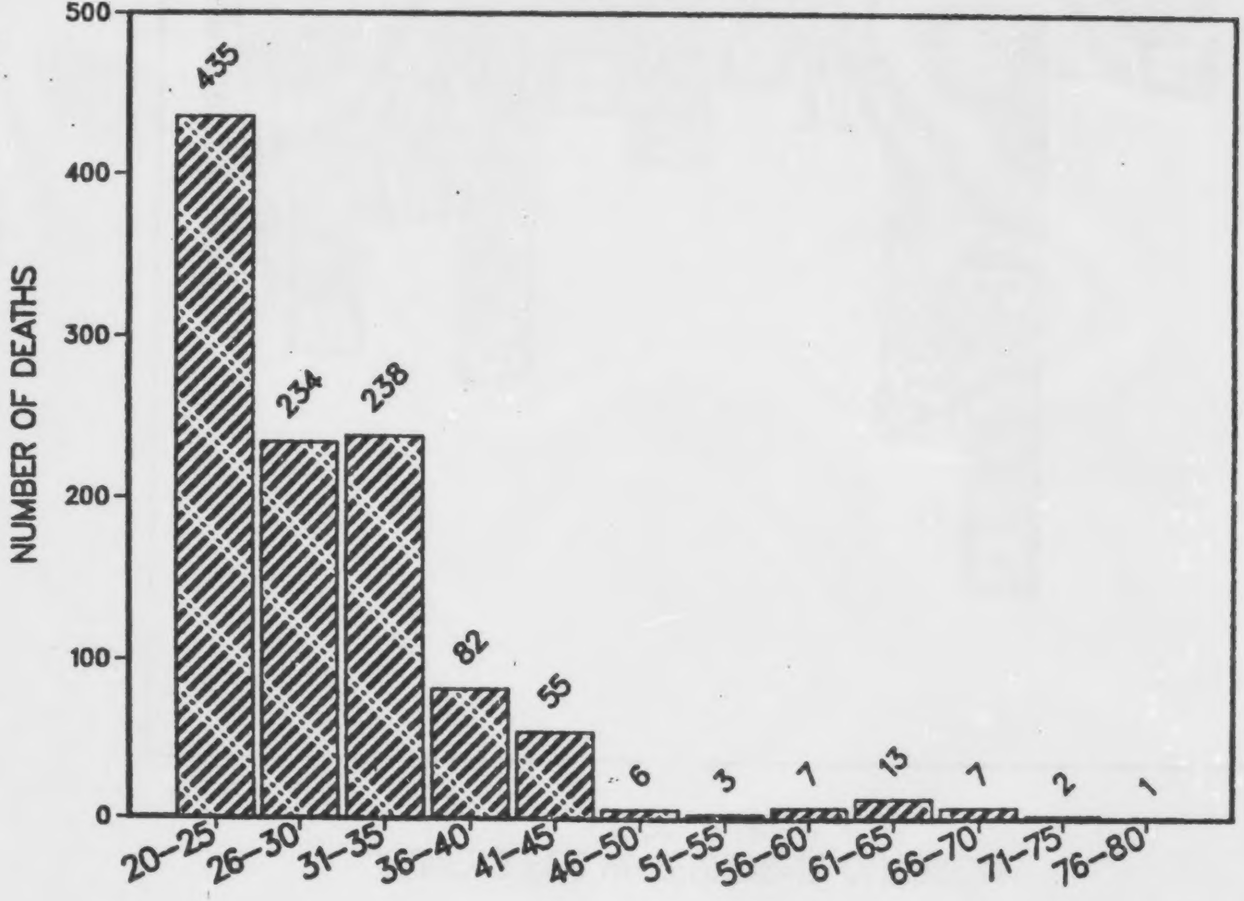


INDIVIDUAL WATER SYSTEMS

ILLNESS PER WATERBORNE OUTBREAK
1920–1980



DEATHS ASSOCIATED WITH WATERBORNE OUTBREAKS 1920–1980



SEASONAL DISTRIBUTION
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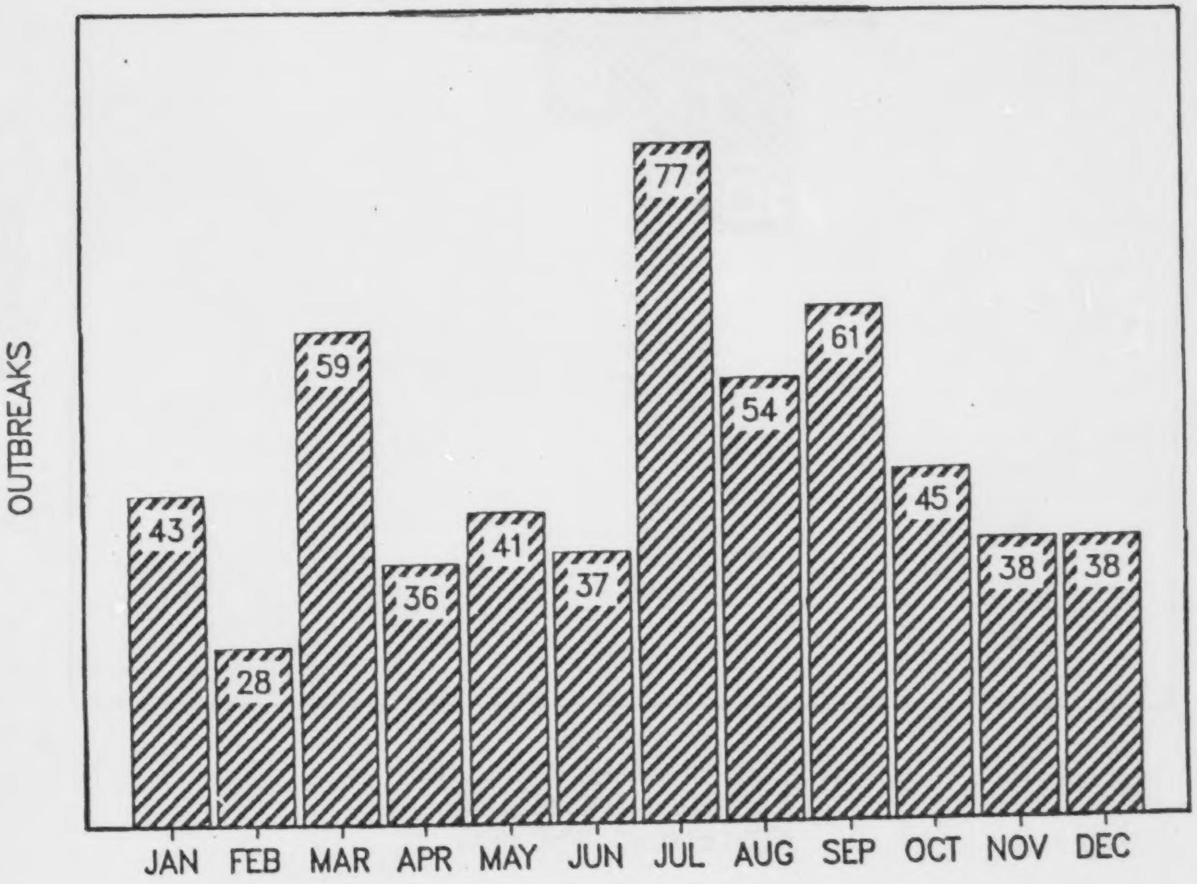
COMMUNITY WATER SYSTEMS
1920–1980



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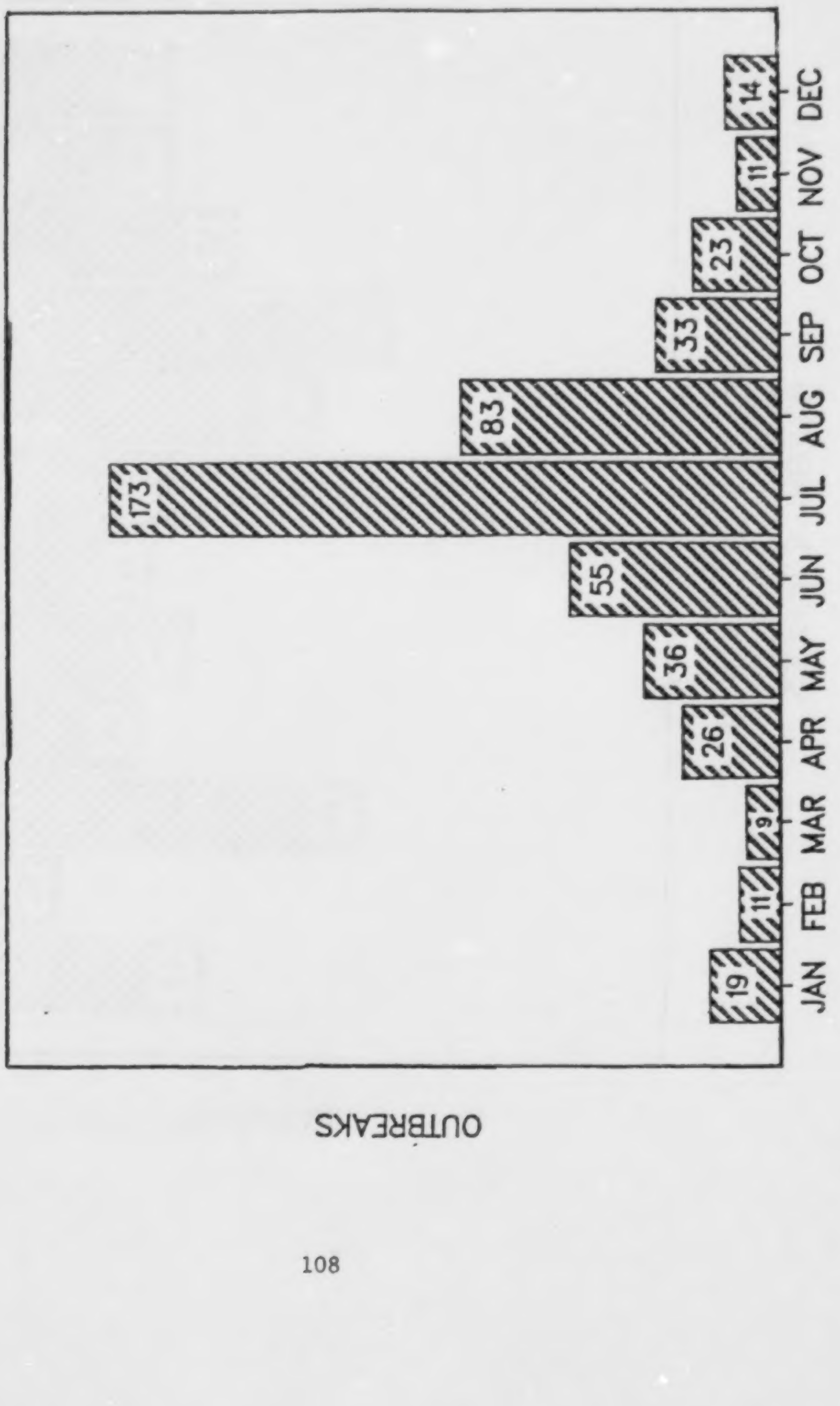
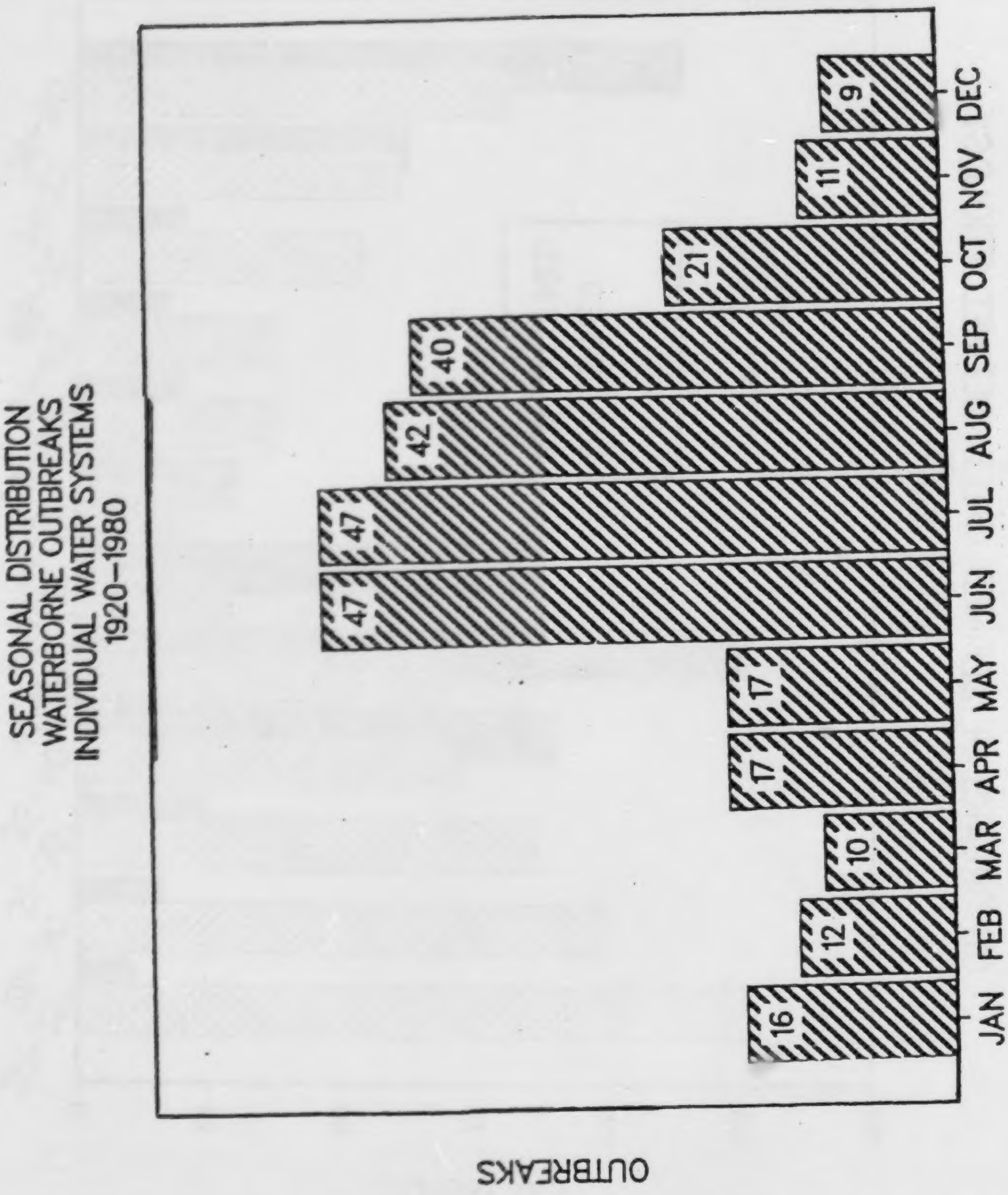
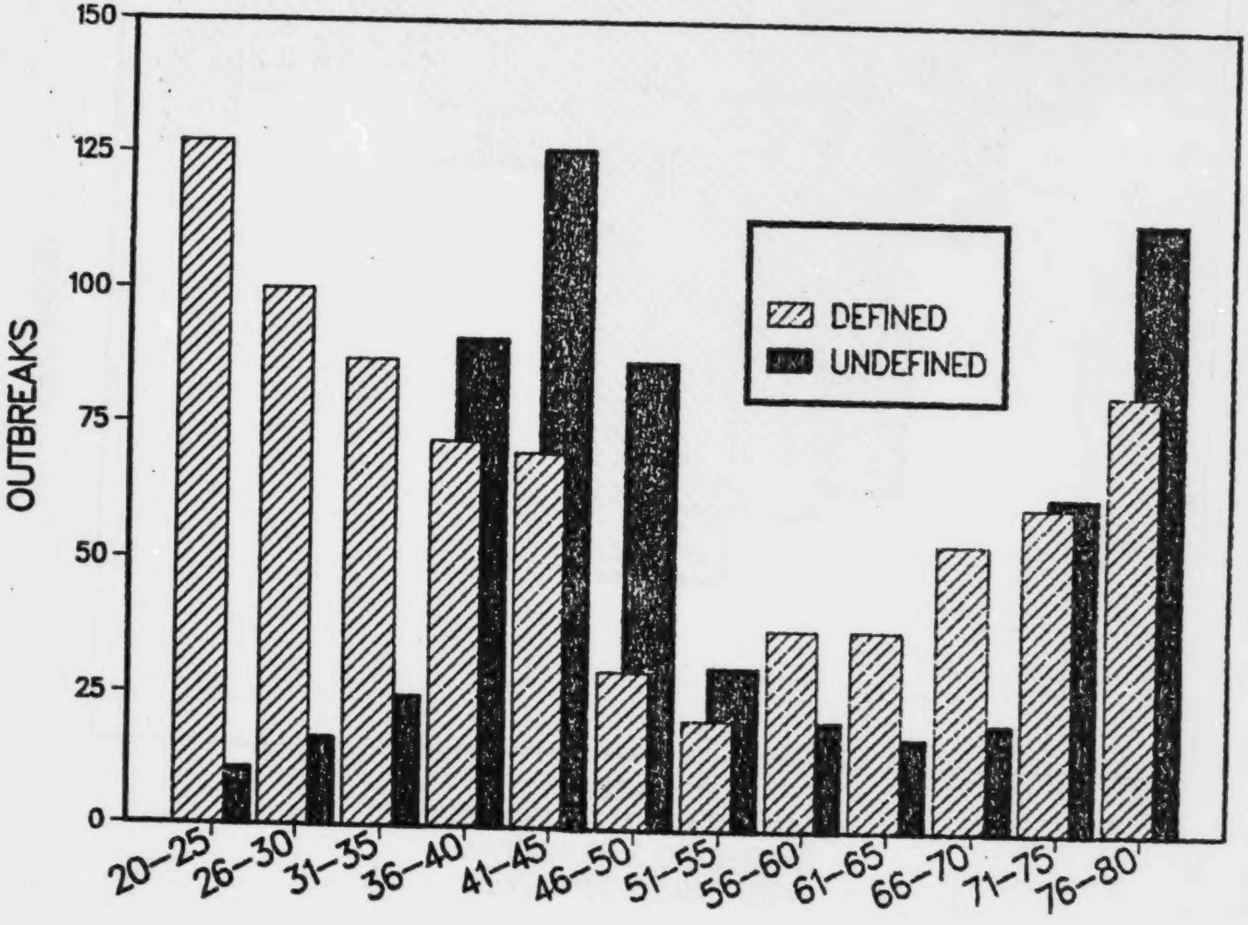
WATERBORNE OUTBREAKS
NONCOMMUNITY WATER SYSTEMS
1920–1980



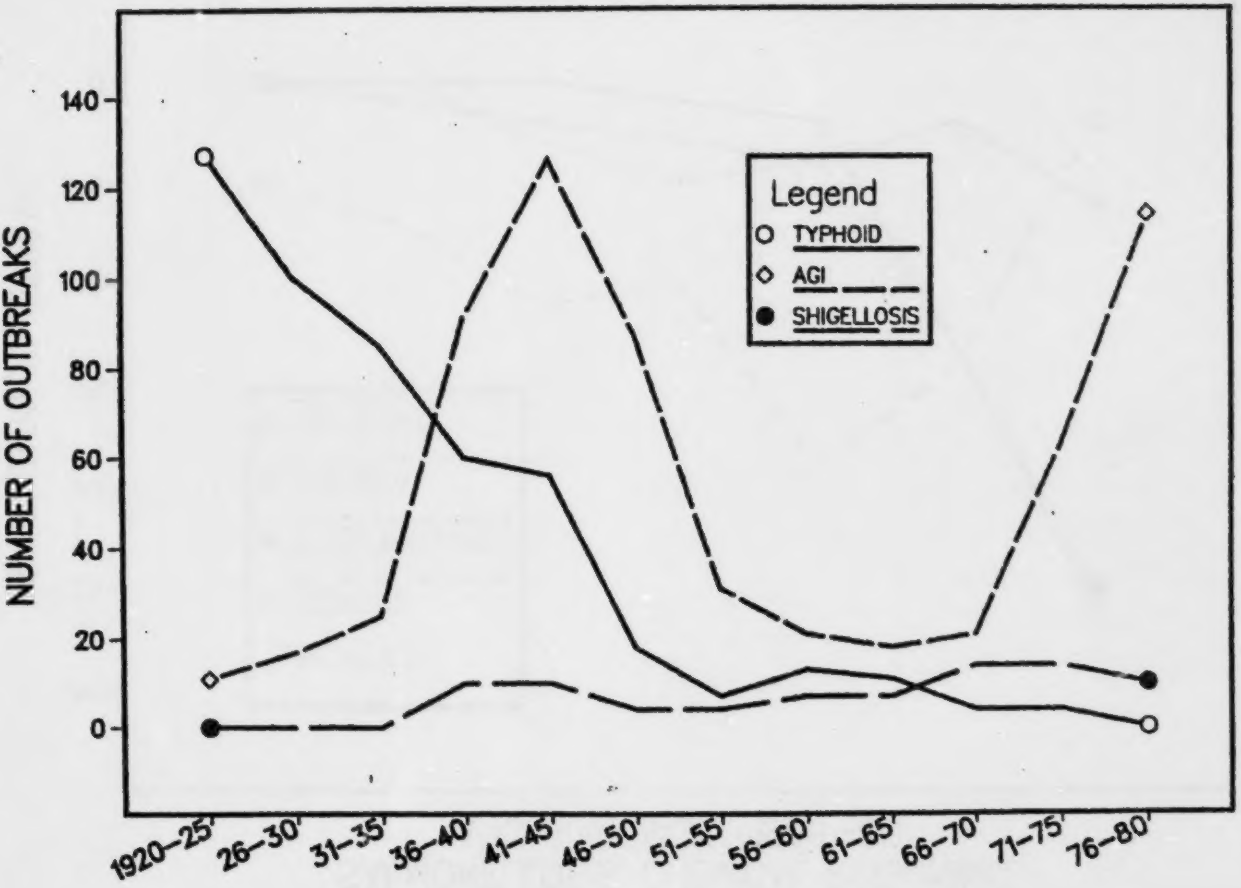


SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS
INDIVIDUAL WATER SYSTEMS
1920–1980

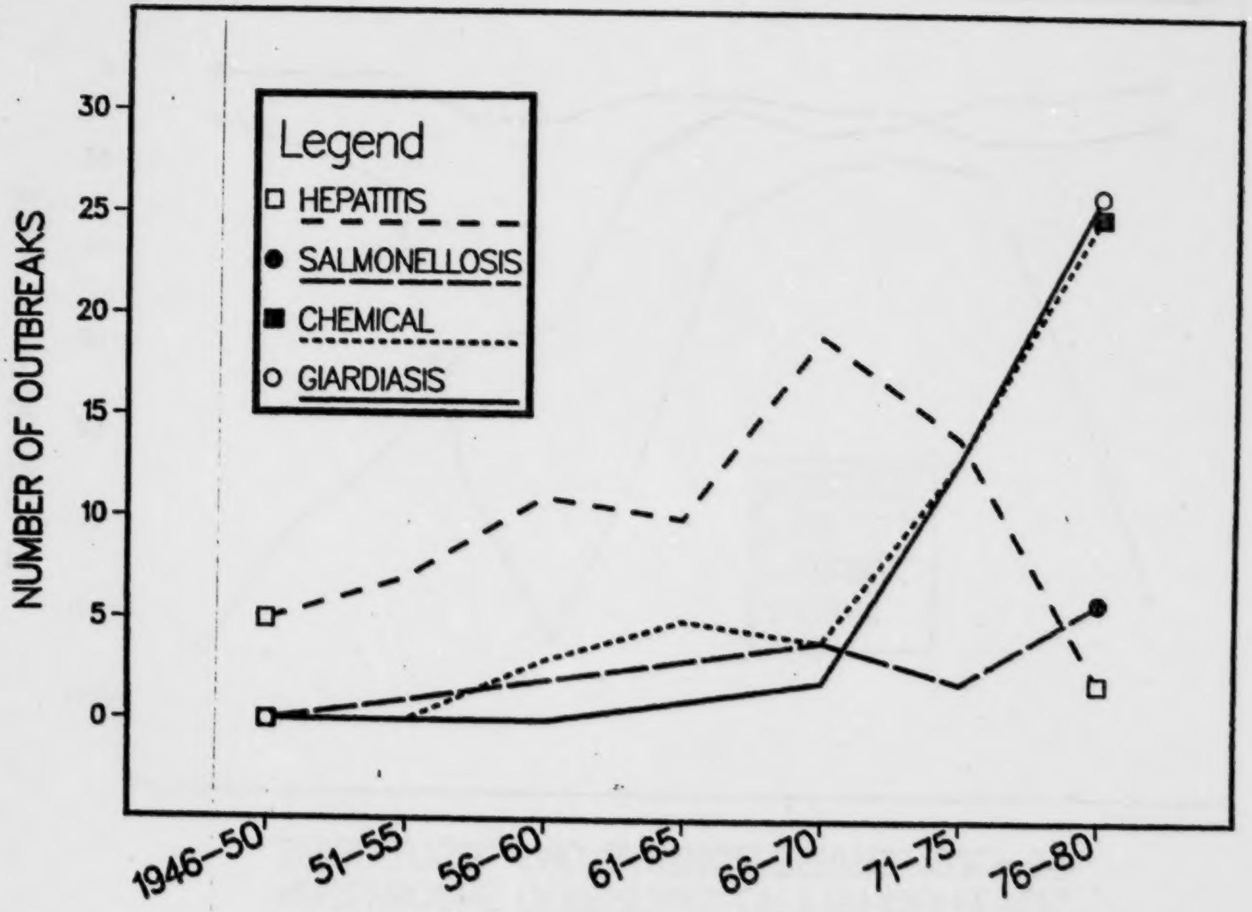
OUTBREAKS OF DEFINED AND UNDEFINED ETIOLOGY
1920–1980



WATERBORNE OUTBREAKS OF TYPHOID FEVER, SHIGELLOSIS, AND GASTROENTERITIS, 1920–80



WATERBORNE OUTBREAKS OF HEPATITIS, SALMONELLOSIS, CHEMICAL POISONING, AND GIARDIASIS, 1946–80



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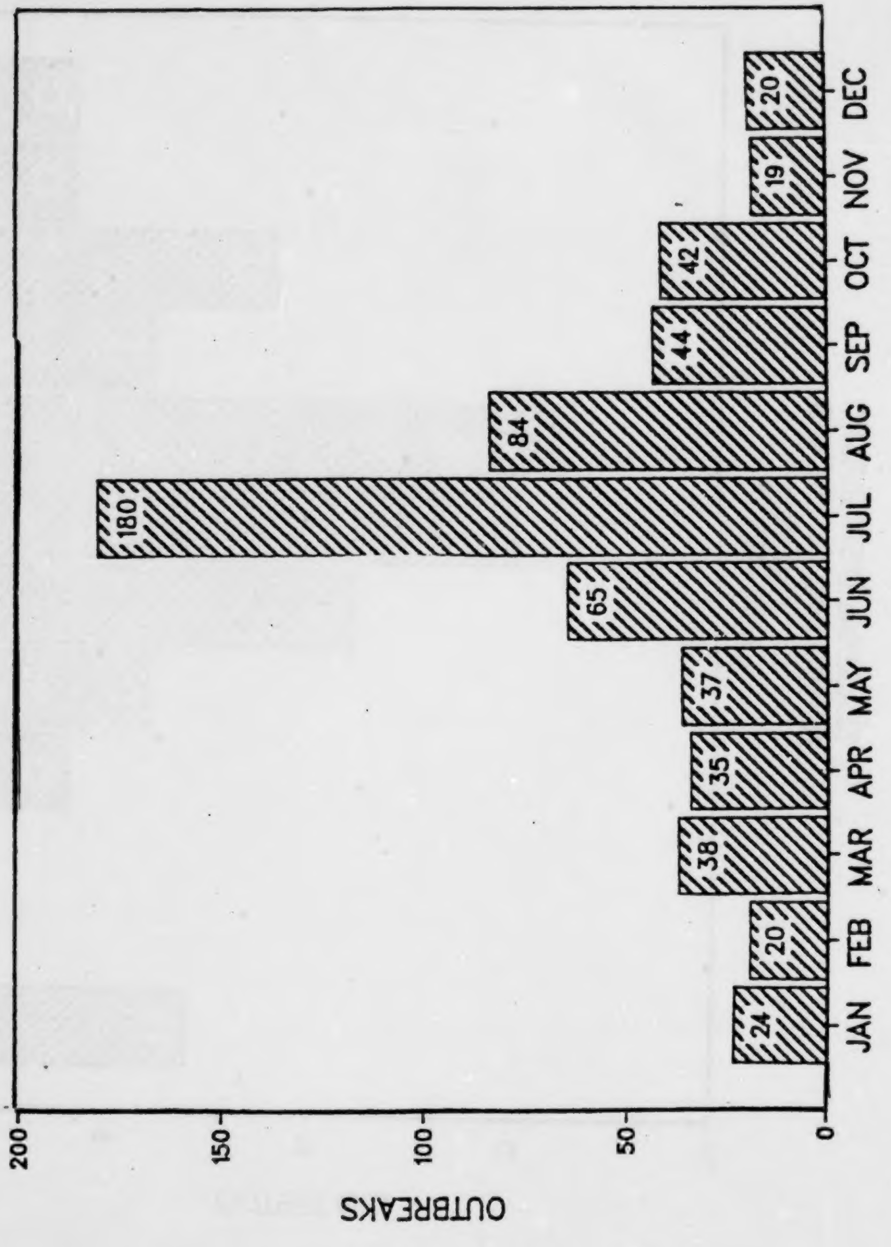
WATERBORNE OUTBREAKS
Gastroenteritis Of Undefined Etiology
1920–1980



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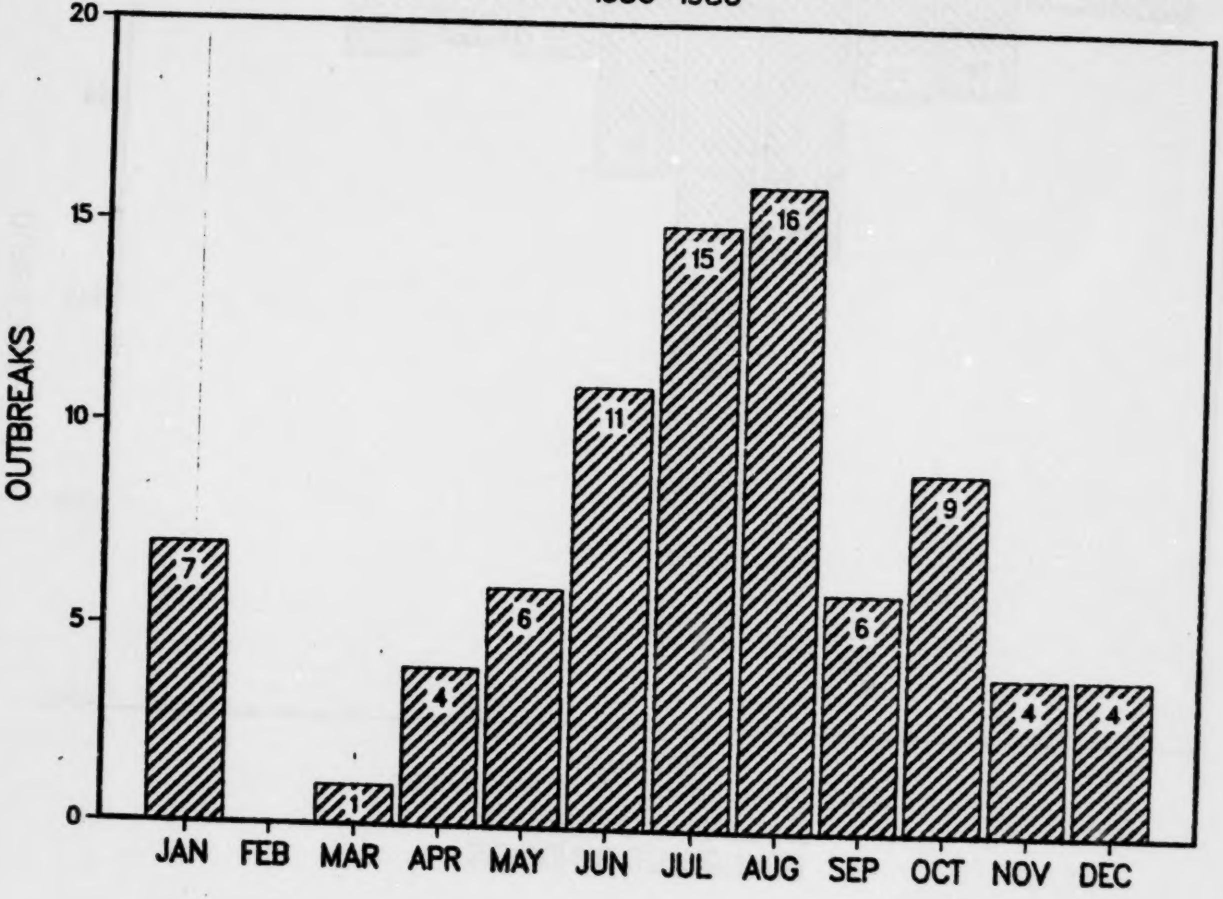
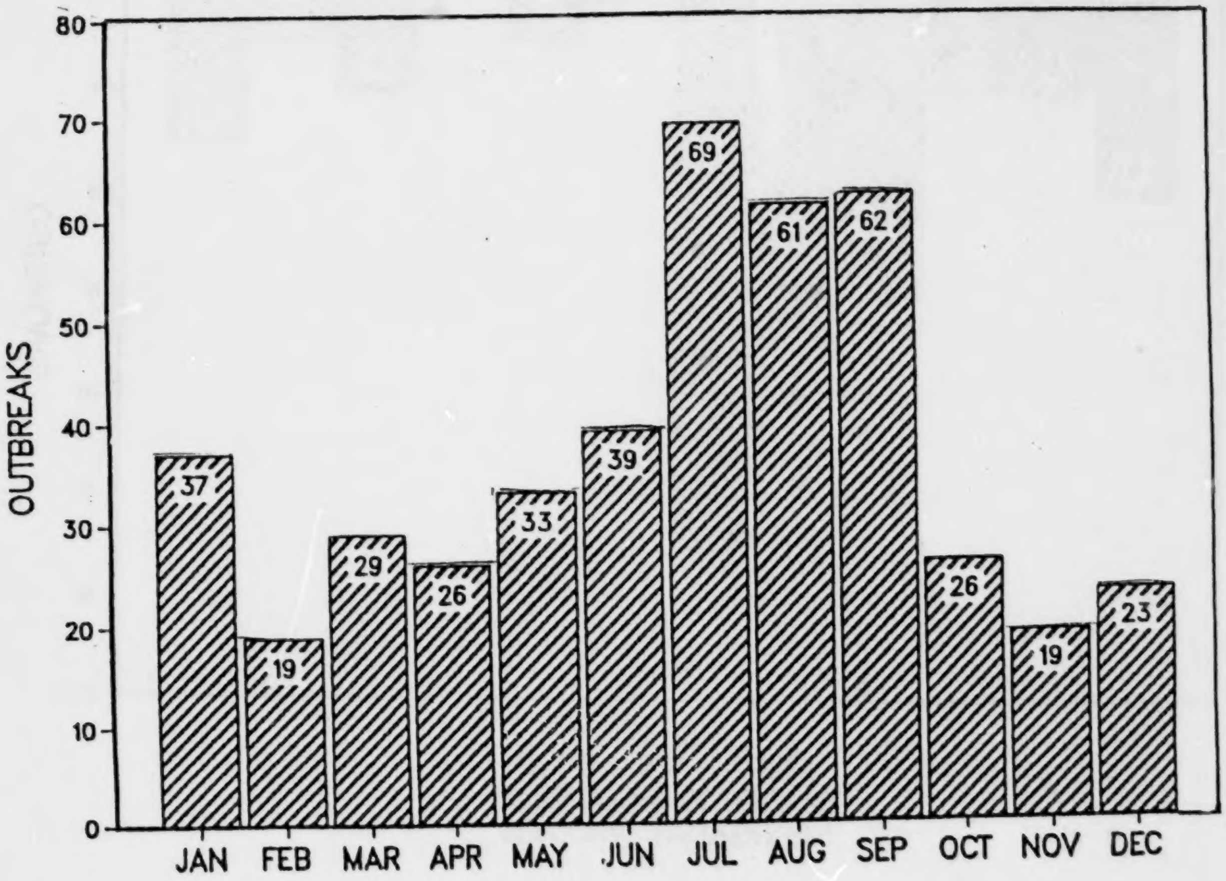
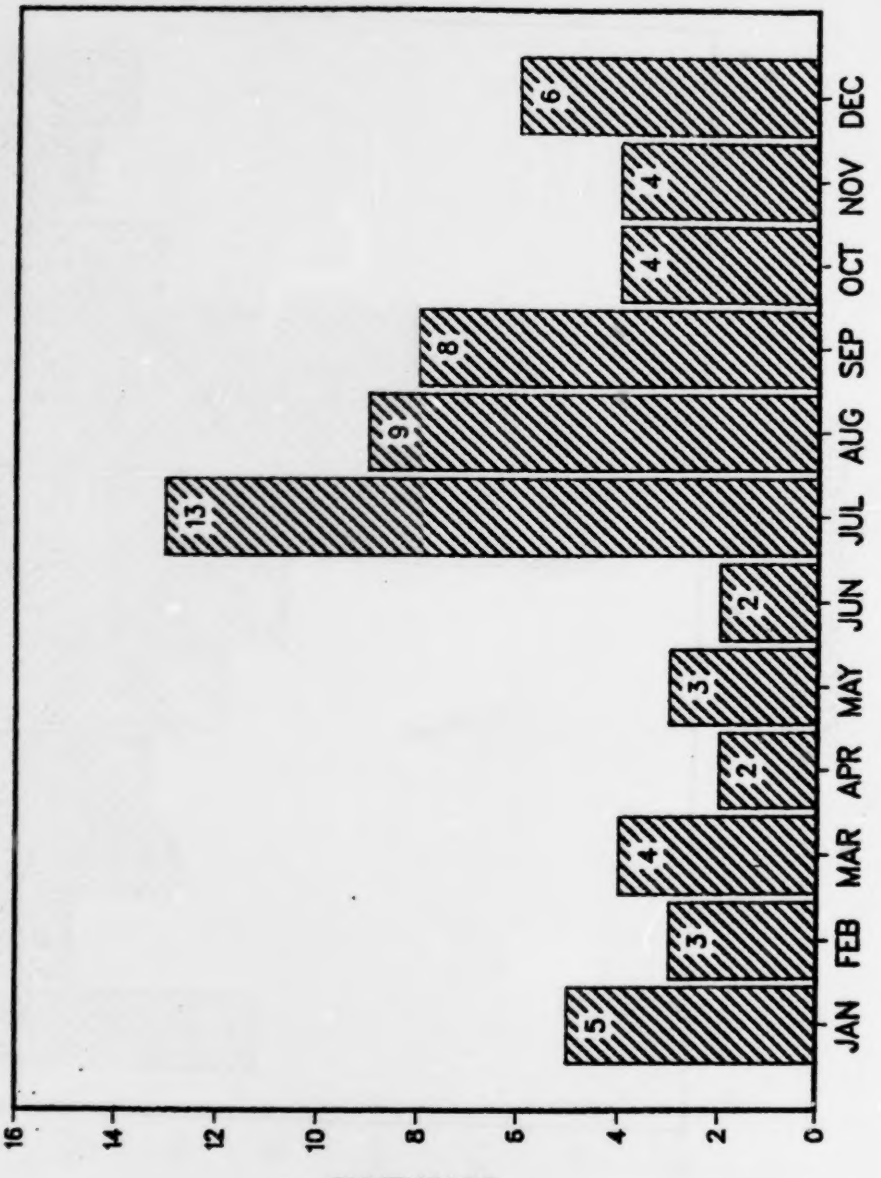
WATERBORNE OUTBREAKS
Of Shigellosis
1936–1980





SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS
Of Typhold
1920–1980

SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS
Of Infectious Hepatitis
1931–1980



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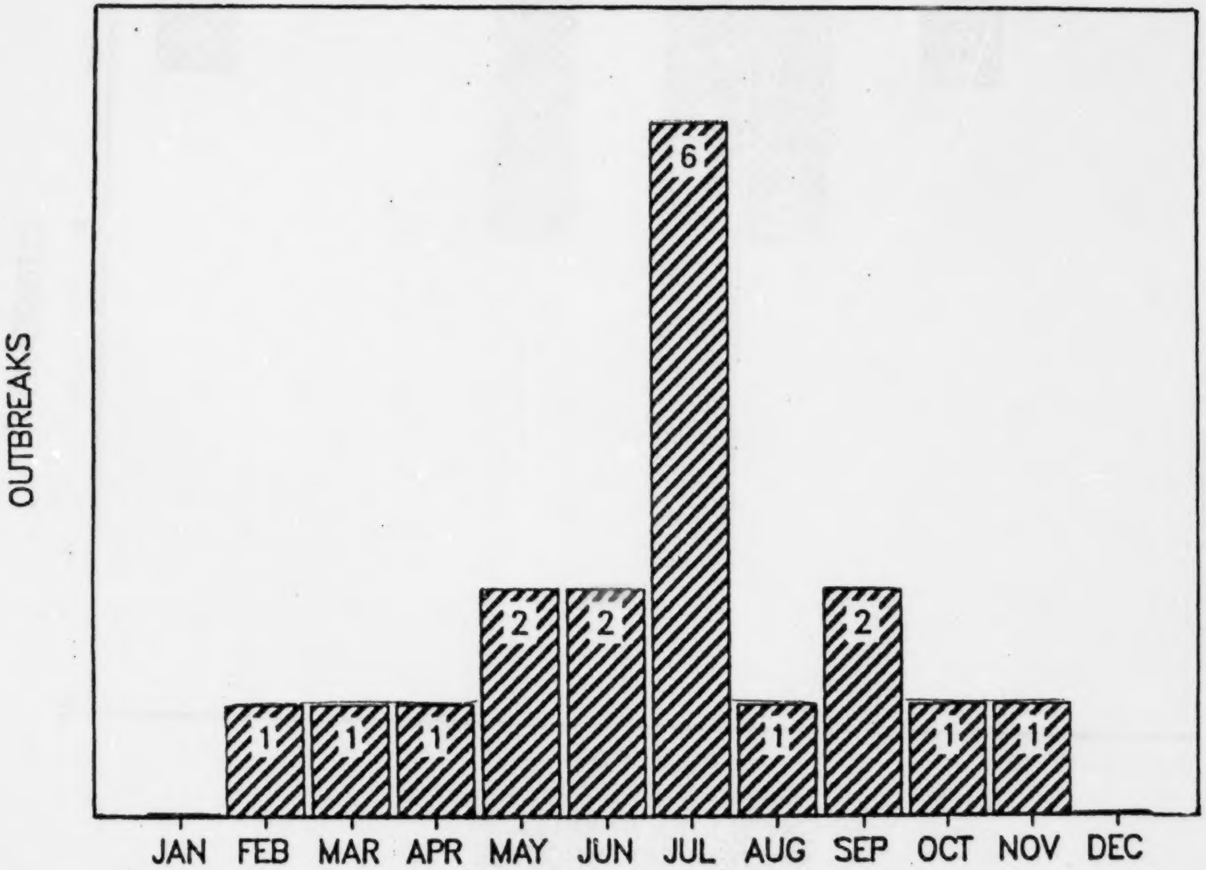
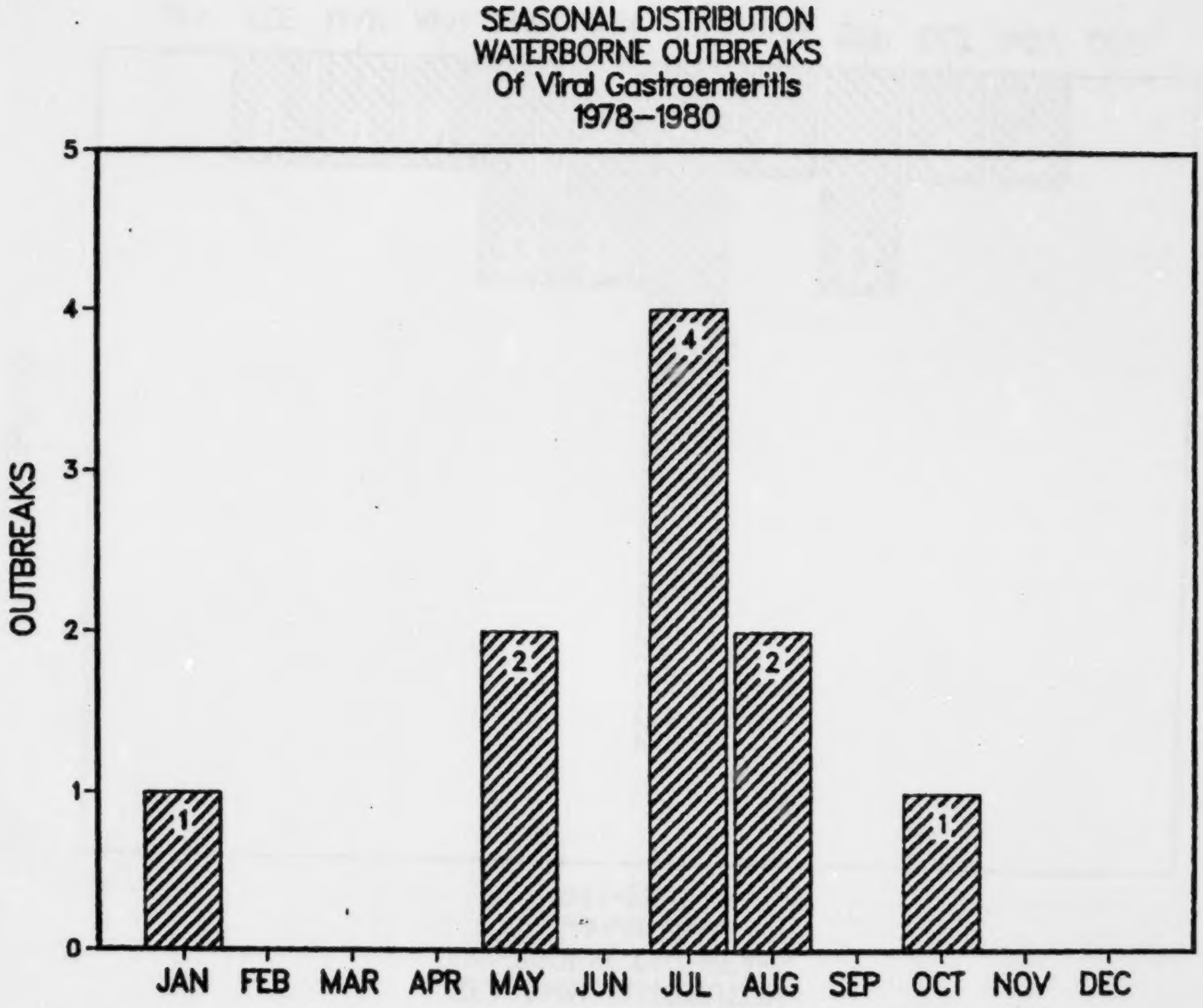
WATERBORNE OUTBREAKS
OF Salmonellosis
1941–1980

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WATERBORNE OUTBREAKS
Of Viral Gastroenteritis
1978–1980
OUTBREAKS
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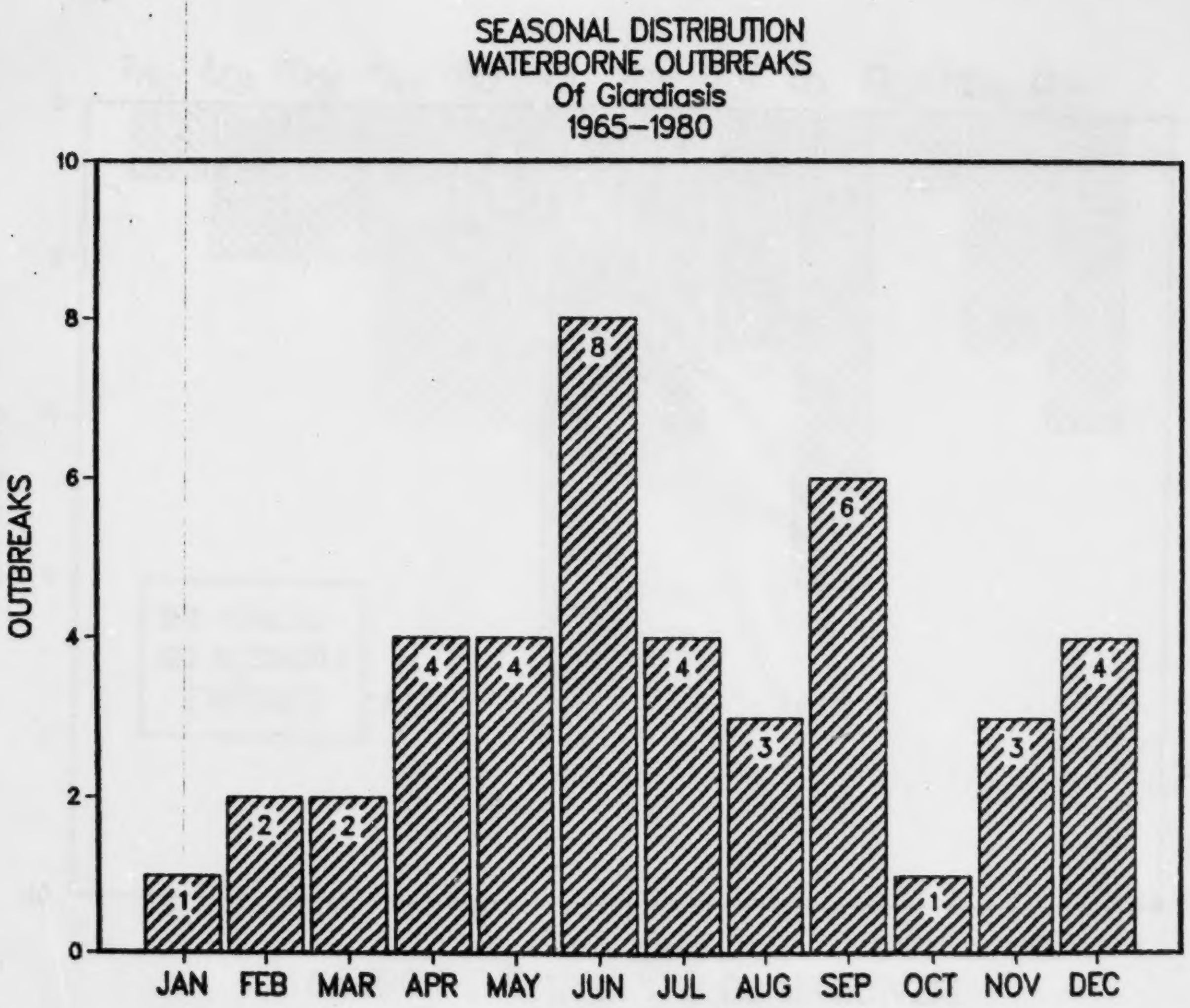
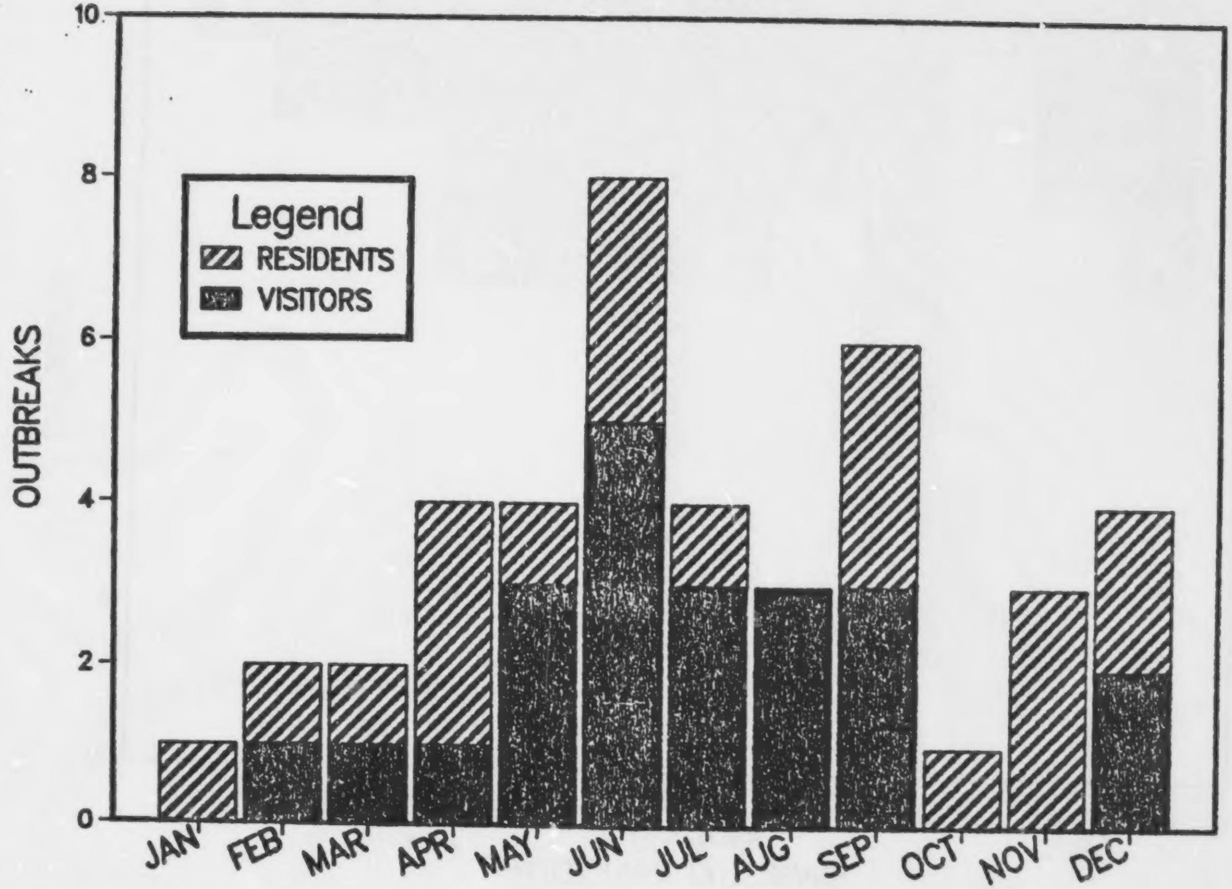


SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS
Of Giardiasis
1965–1980

SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS OF GIARDIASIS
1965–1980



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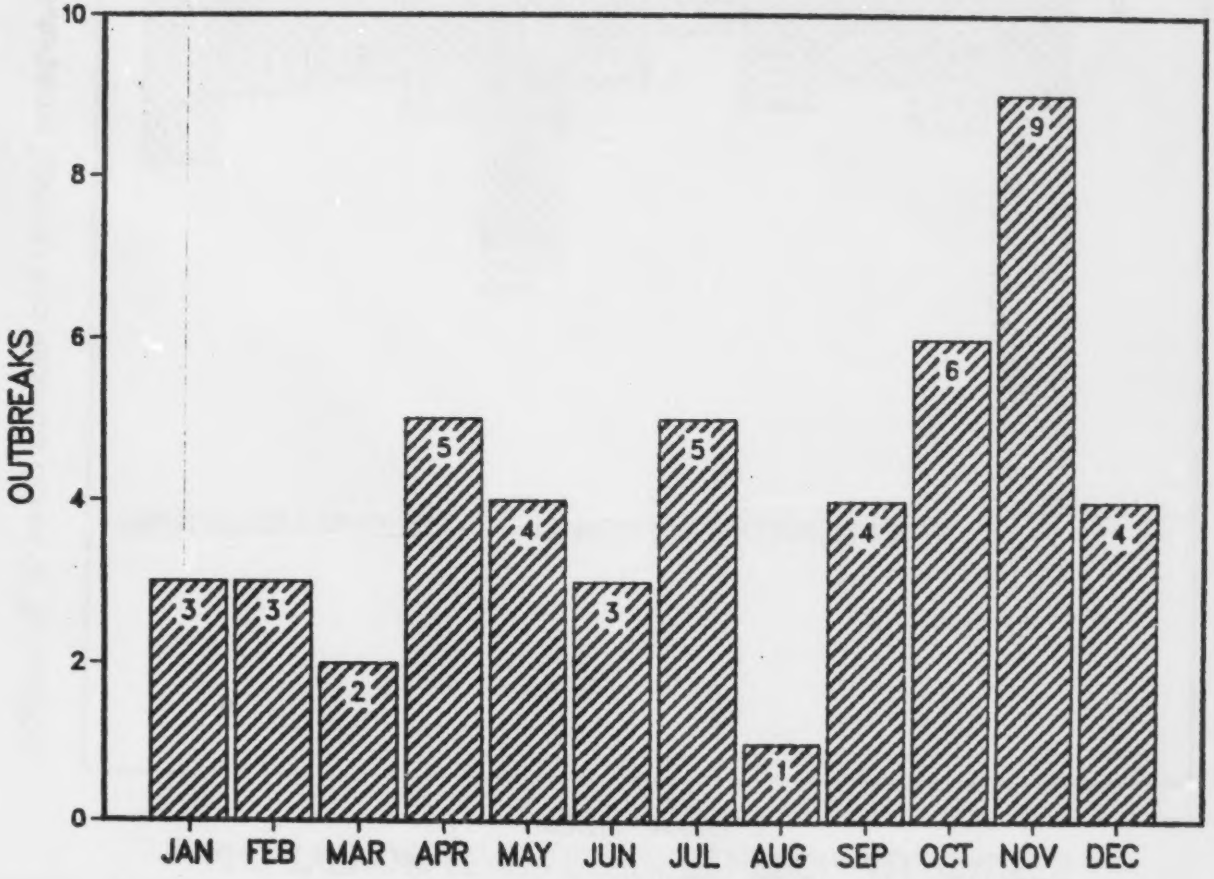
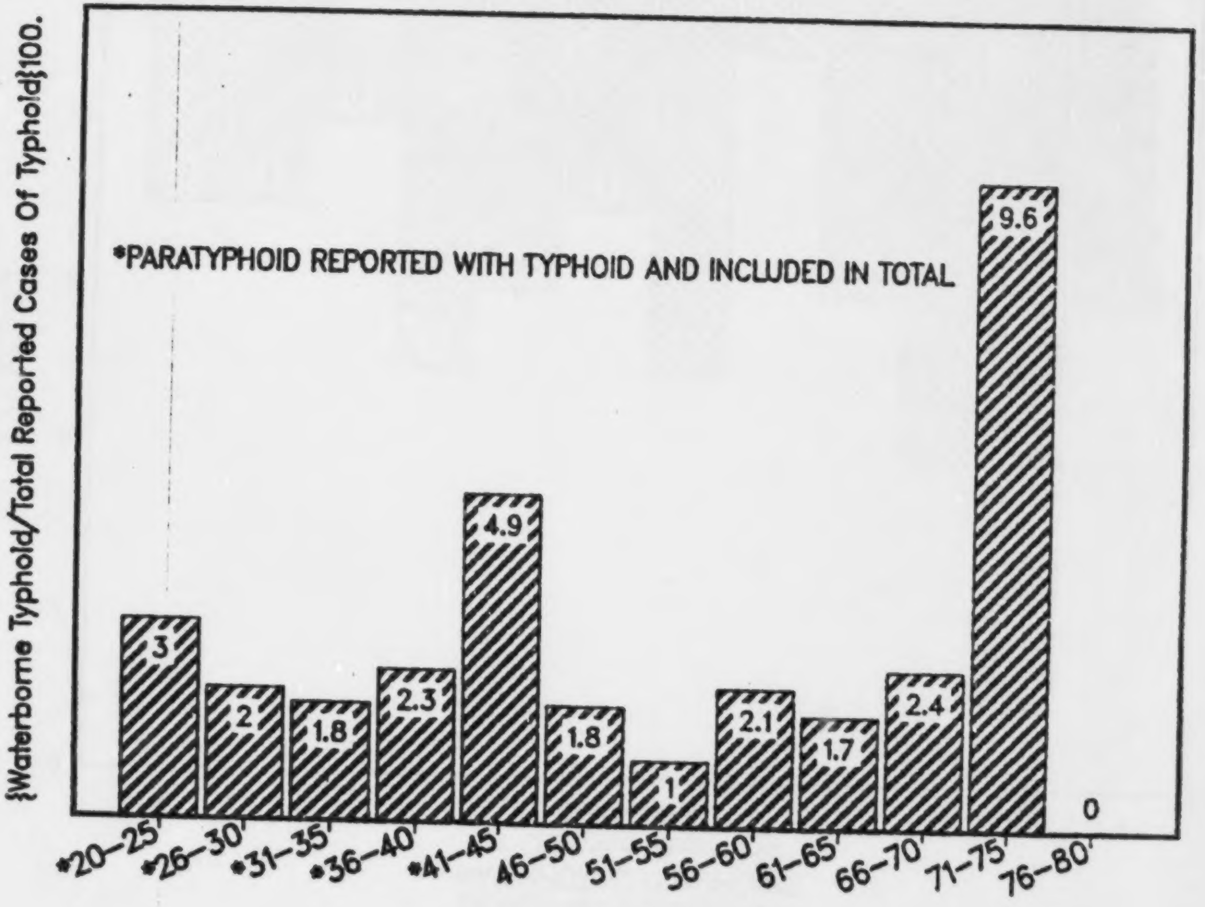
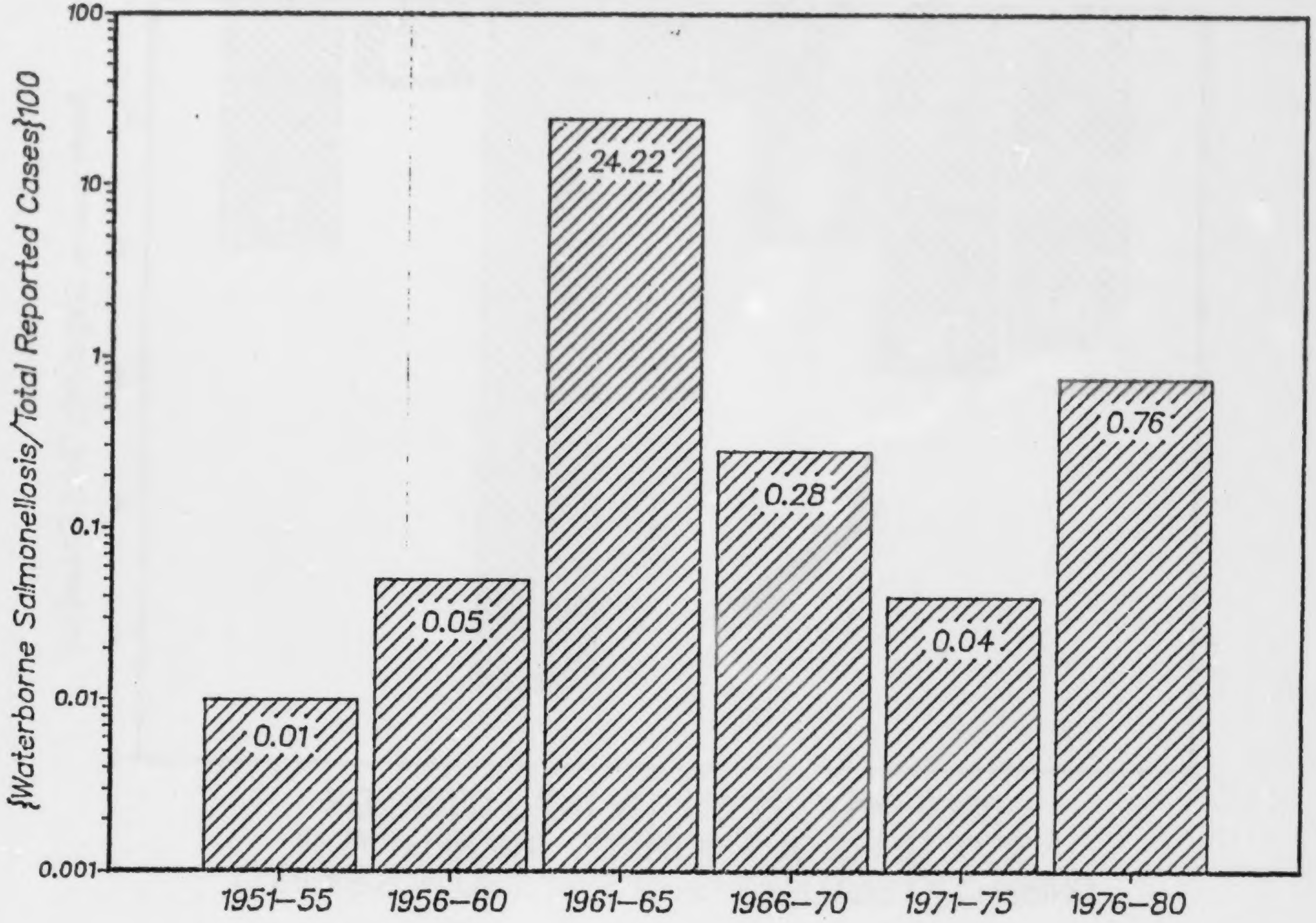
WATERBORNE OUTBREAKS
Of Chemical Poisoning
1936–1980



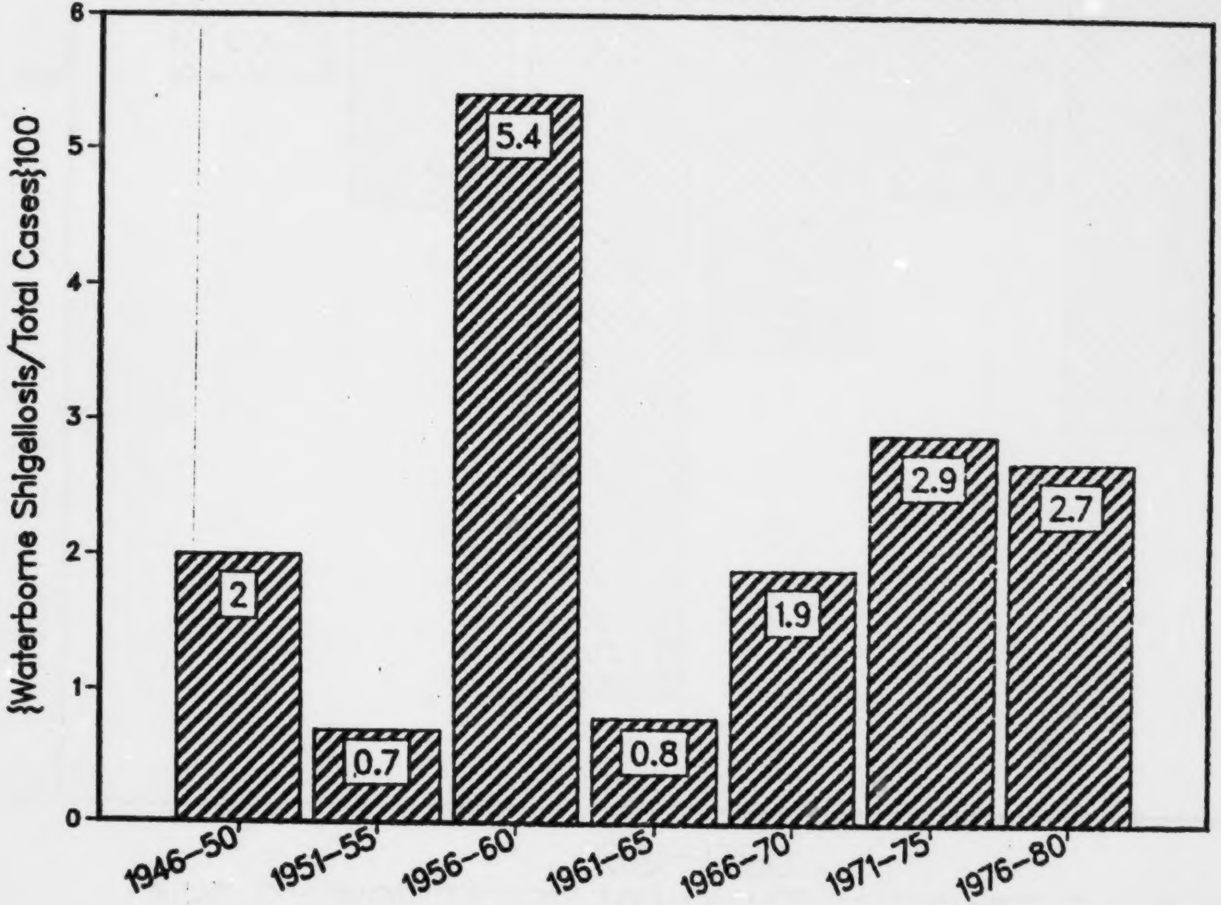
COMPARISON OF TYPHOID FEVER OCCURRING IN WATERBORNE OUTBREAKS AND TYPHOID FEVER REPORTED FROM ALL CAUSES
1920–1980



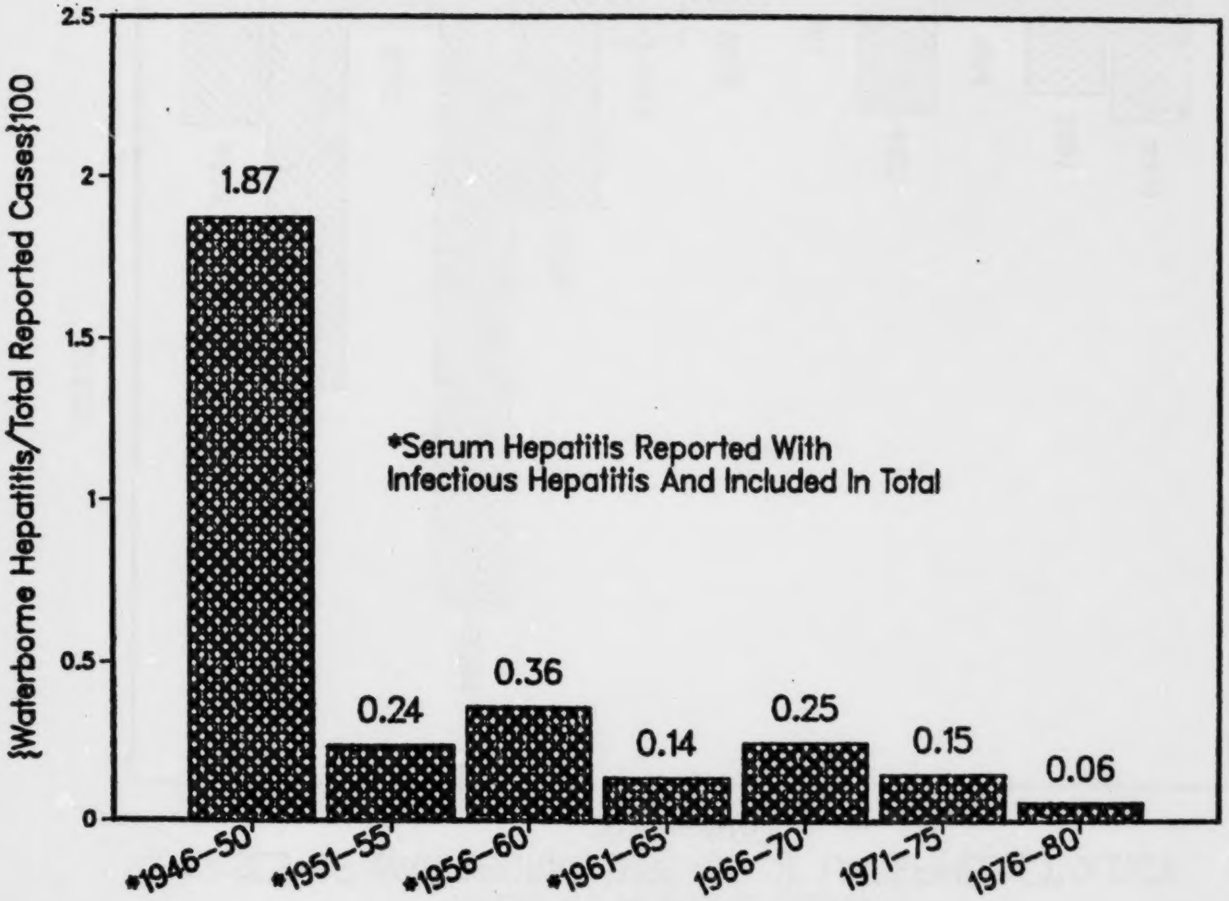
COMPARISON OF SALMONELLOSIS OCCURRING IN WATERBORNE OUTBREAKS AND SALMONELLOSIS REPORTED FROM ALL CAUSES
1951–1980



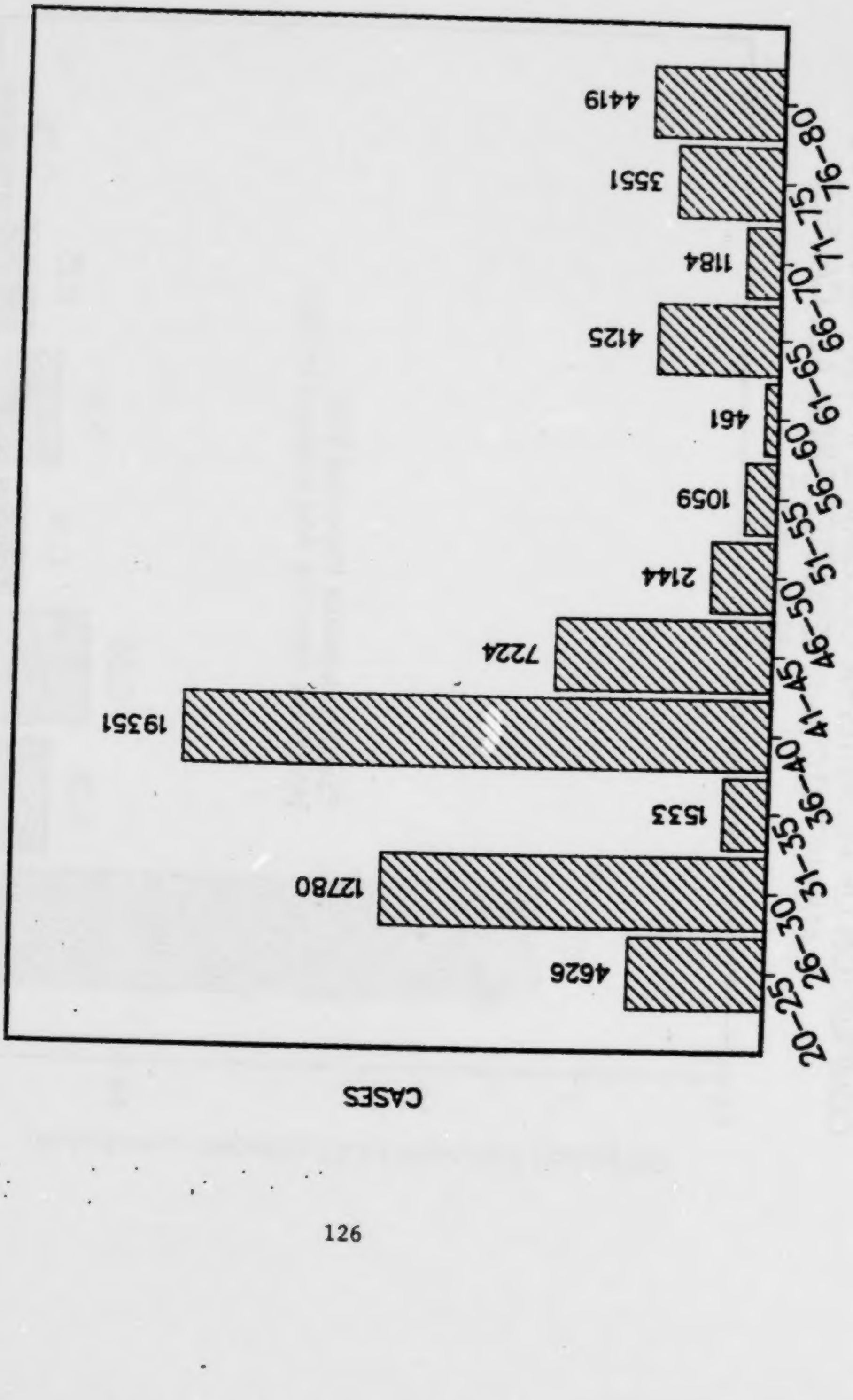
COMPARISON OF CASES OF SHIGELLOSIS OCCURRING IN WATERBORNE OUTBREAKS TO SHIGELLOSIS REPORTED FROM ALL CAUSES 1946–1980



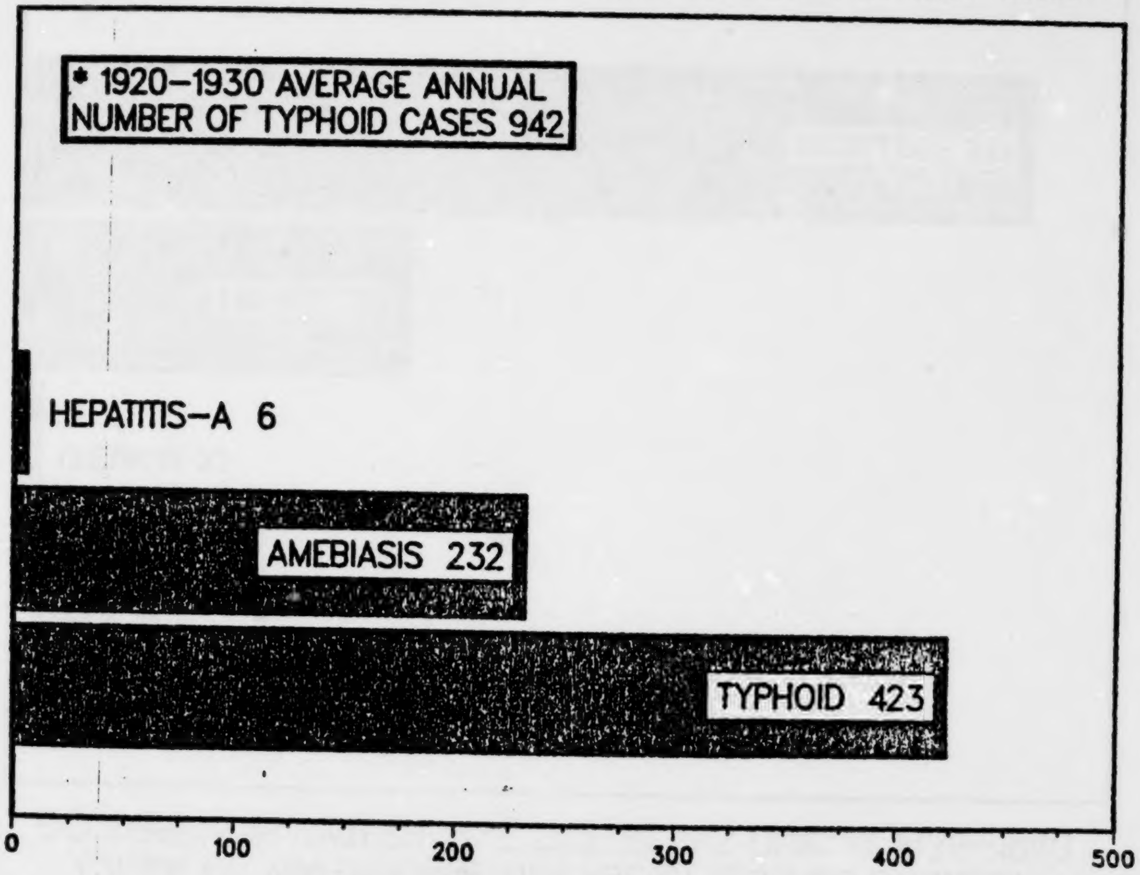
COMPARISON OF HEPATITIS–A OCCURRING IN WATERBORNE OUTBREAKS AND HEPATITIS–A REPORTED FROM ALL CAUSES
1946–1980



AVERAGE ANNUAL NUMBER
CASES OF WATERBORNE DISEASE OF UNDEFINED ETIOLOGY
1920–1980



AVERAGE ANNUAL NUMBER CASES OF WATERBORNE DISEASE OF DEFINED ETIOLOGY OCCURRING IN WATERBORNE OUTBREAKS DURING 1931–1935*



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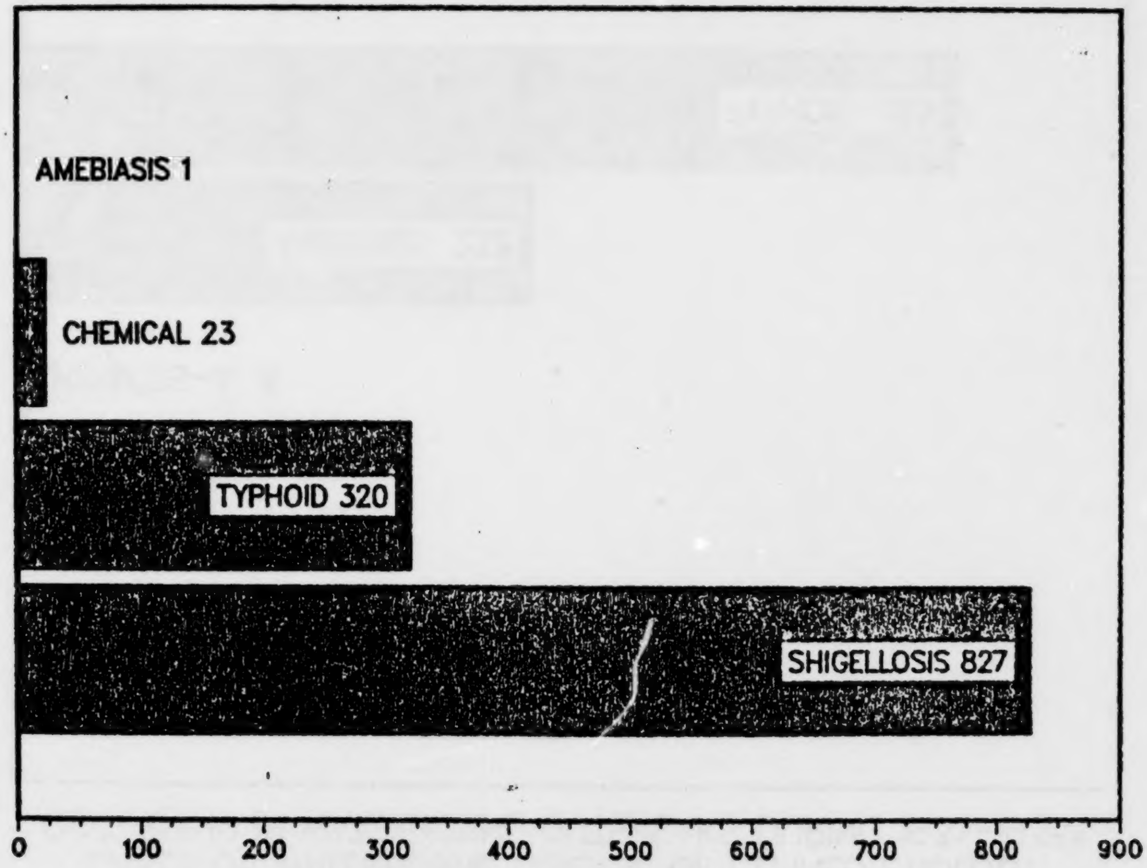
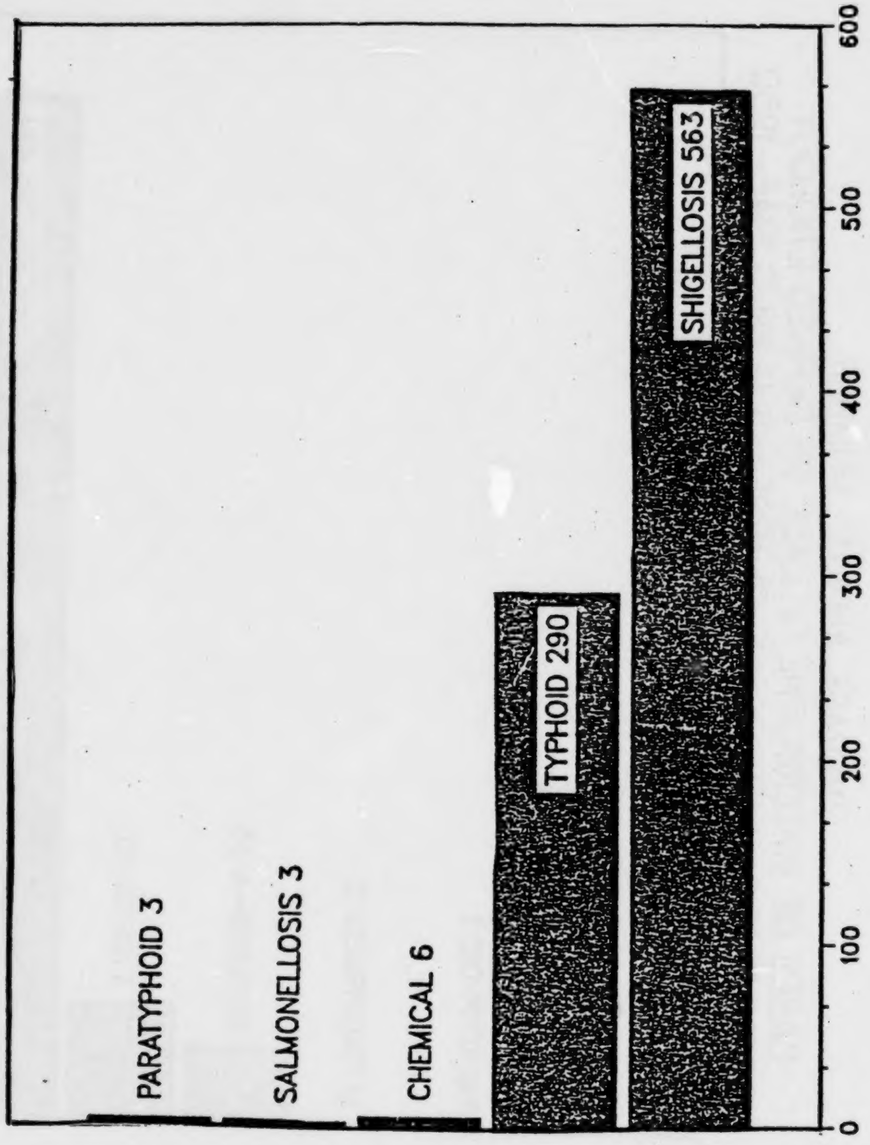
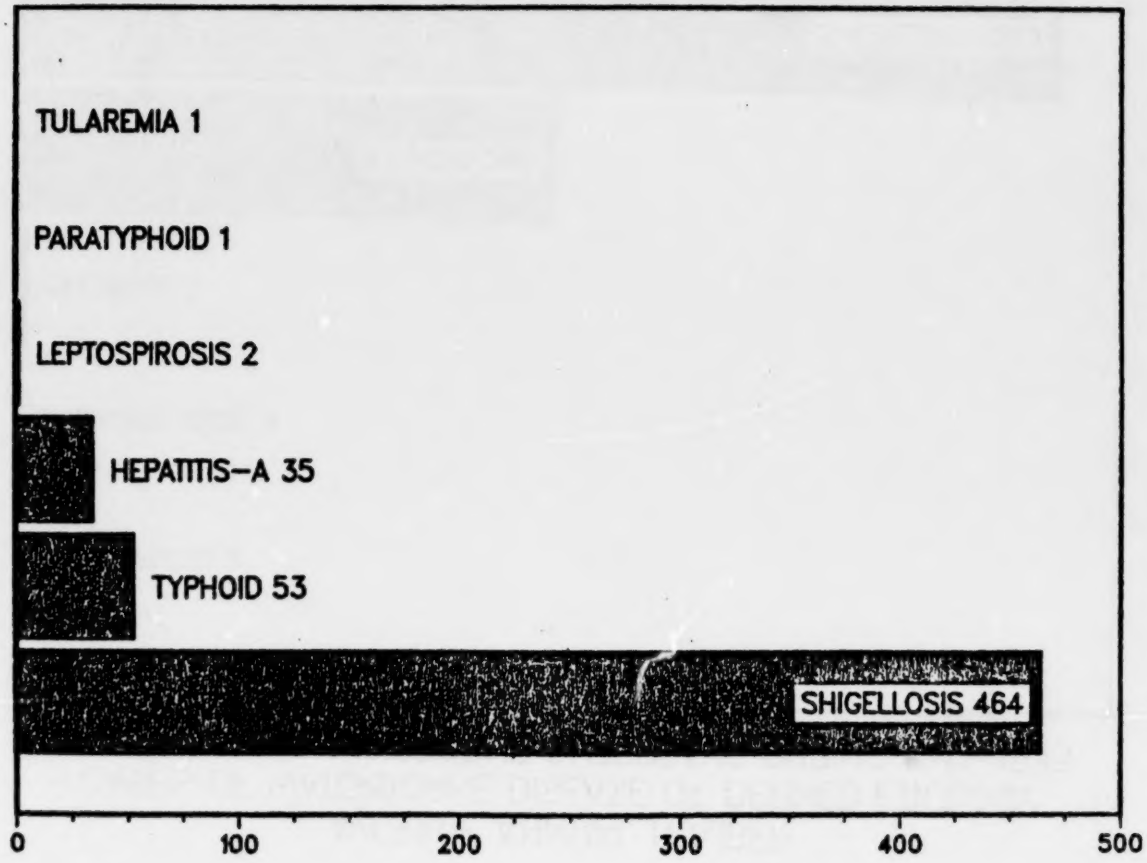




AVERAGE ANNUAL NUMBER
CASES OF WATERBORNE DISEASE OF DEFINED ETIOLOGY
OCCURRING IN WATERBORNE OUTBREAKS DURING 1941–1945

AVERAGE ANNUAL NUMBER
CASES OF WATERBORNE DISEASE OF DEFINED ETIOLOGY
OCCURRING IN WATERBORNE OUTBREAKS DURING 1946–1950



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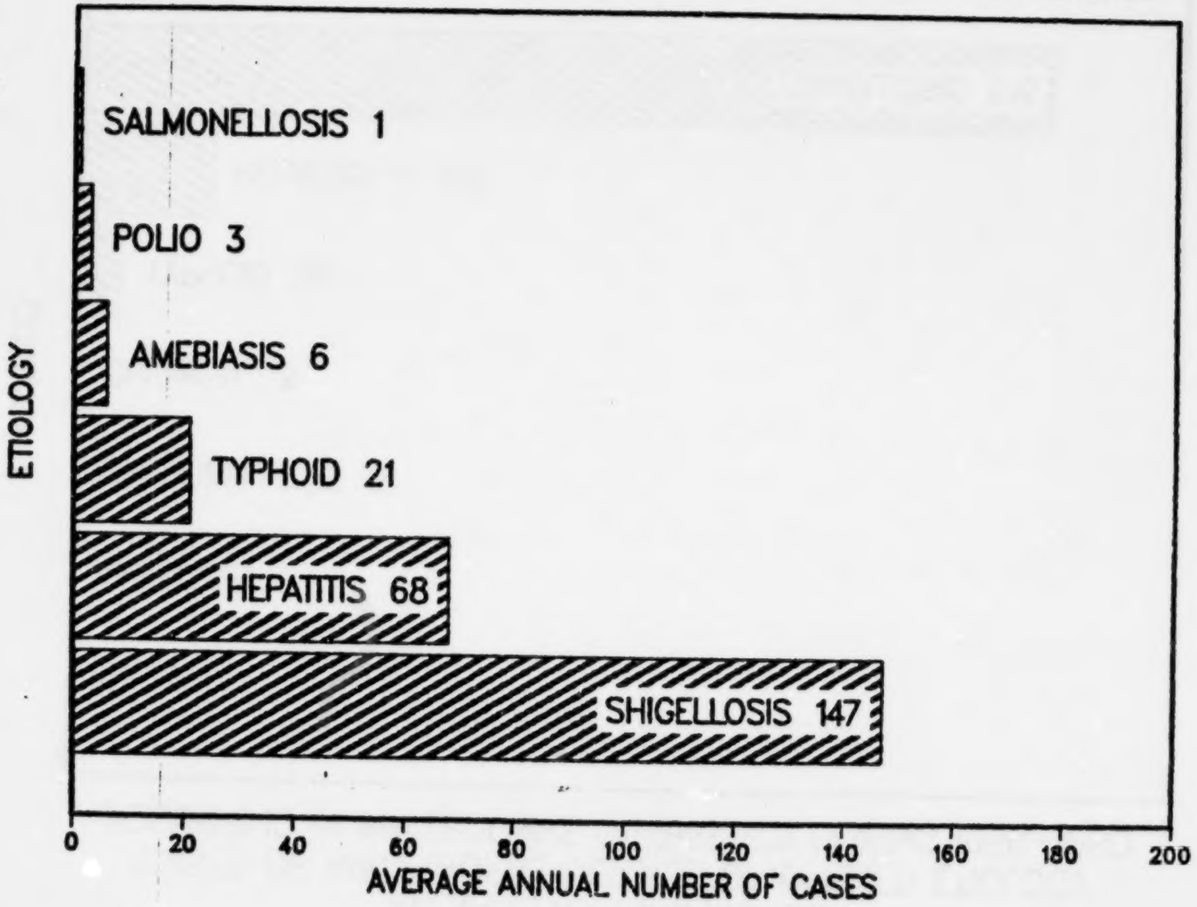

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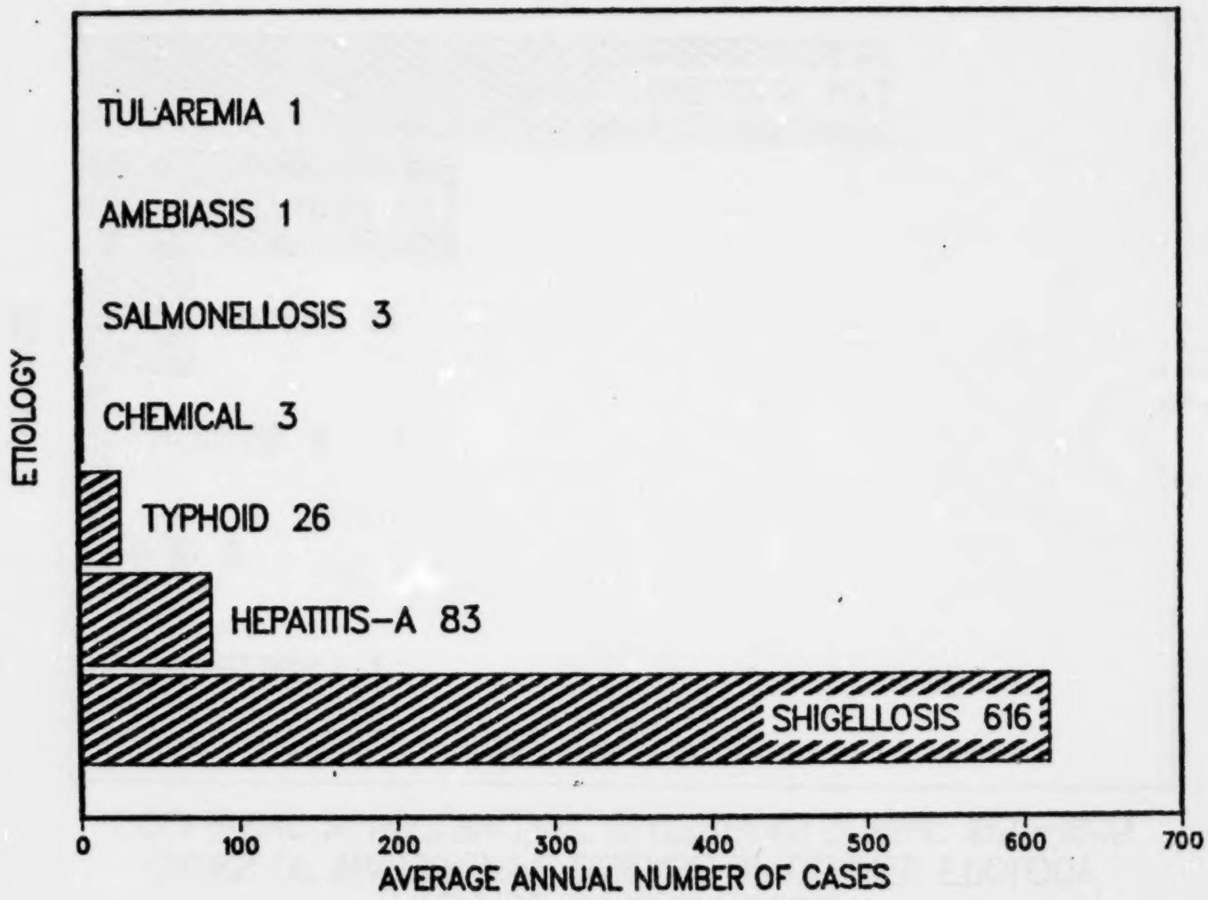

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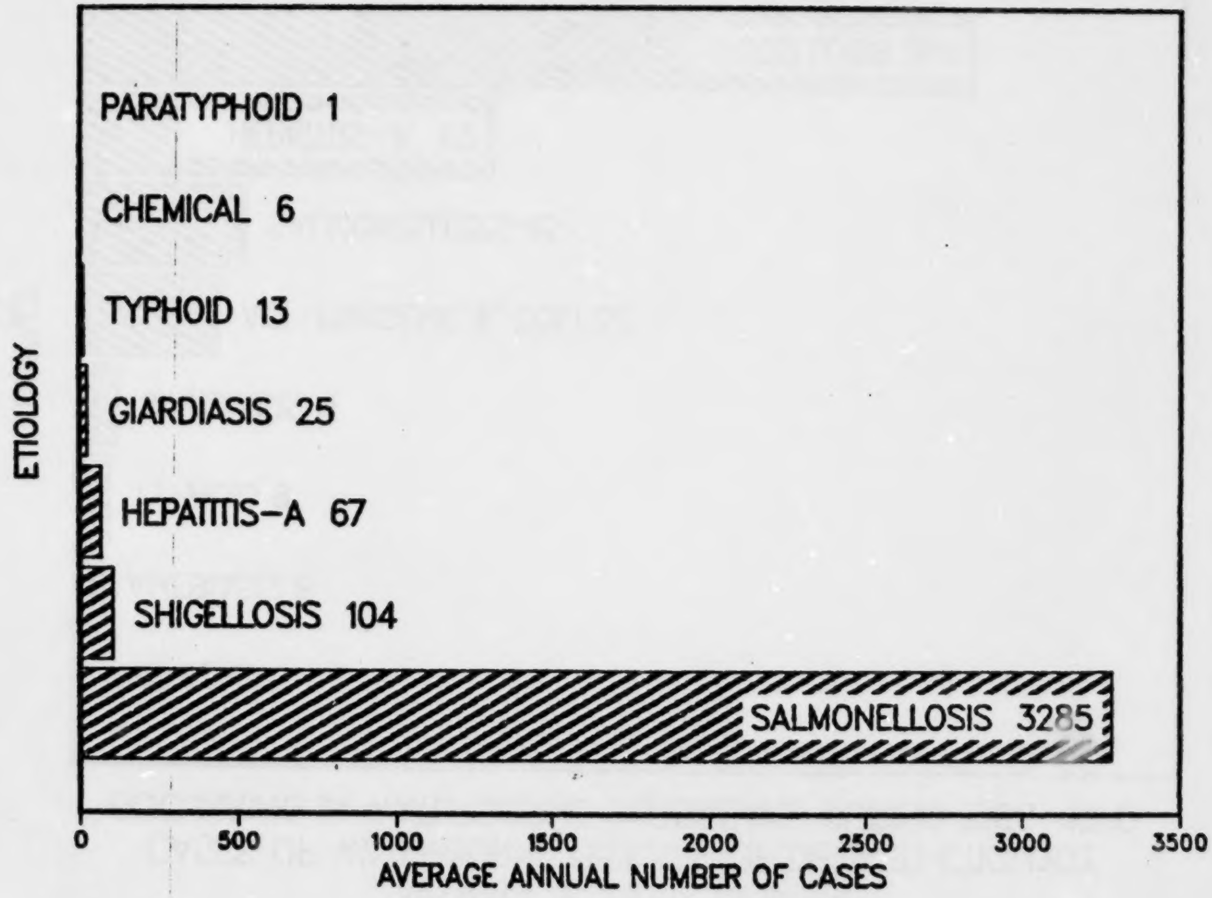

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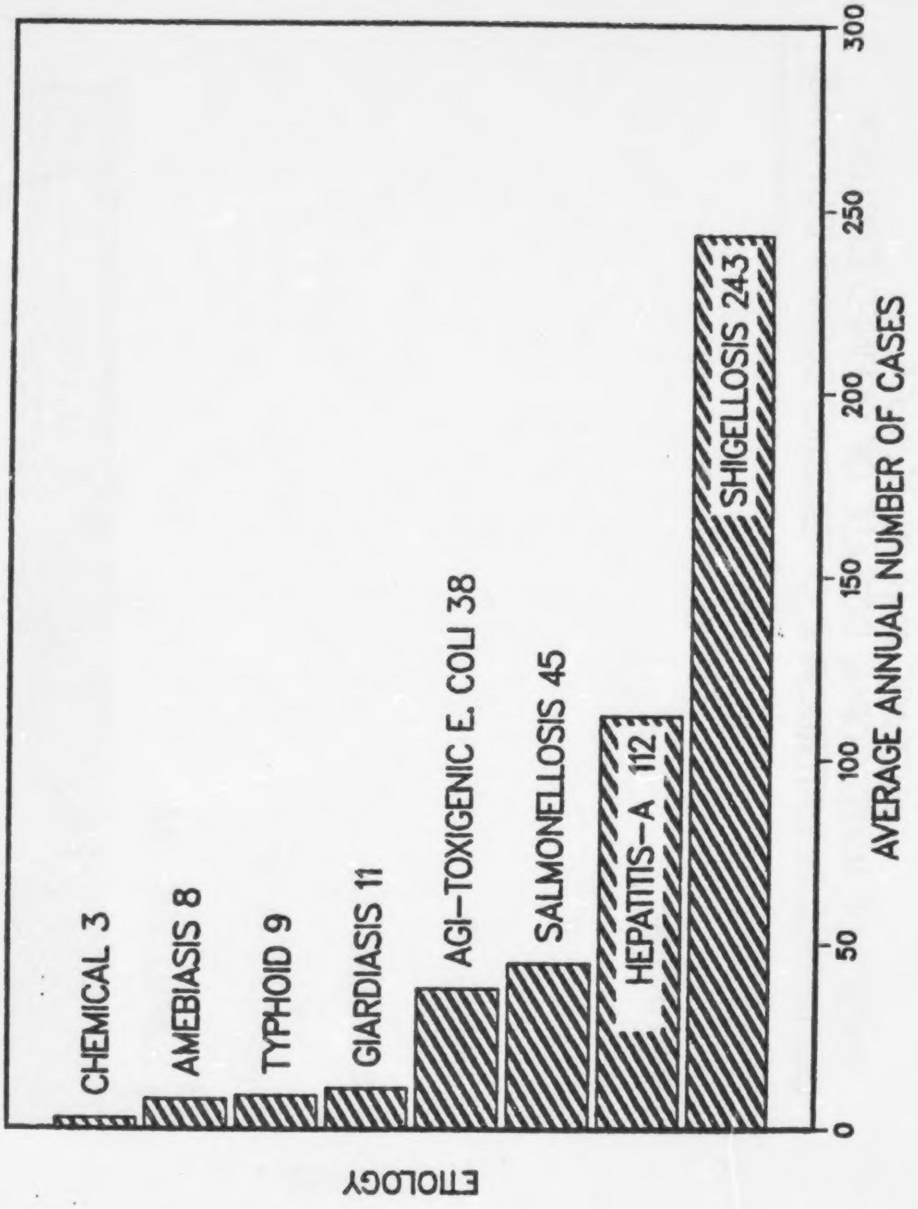

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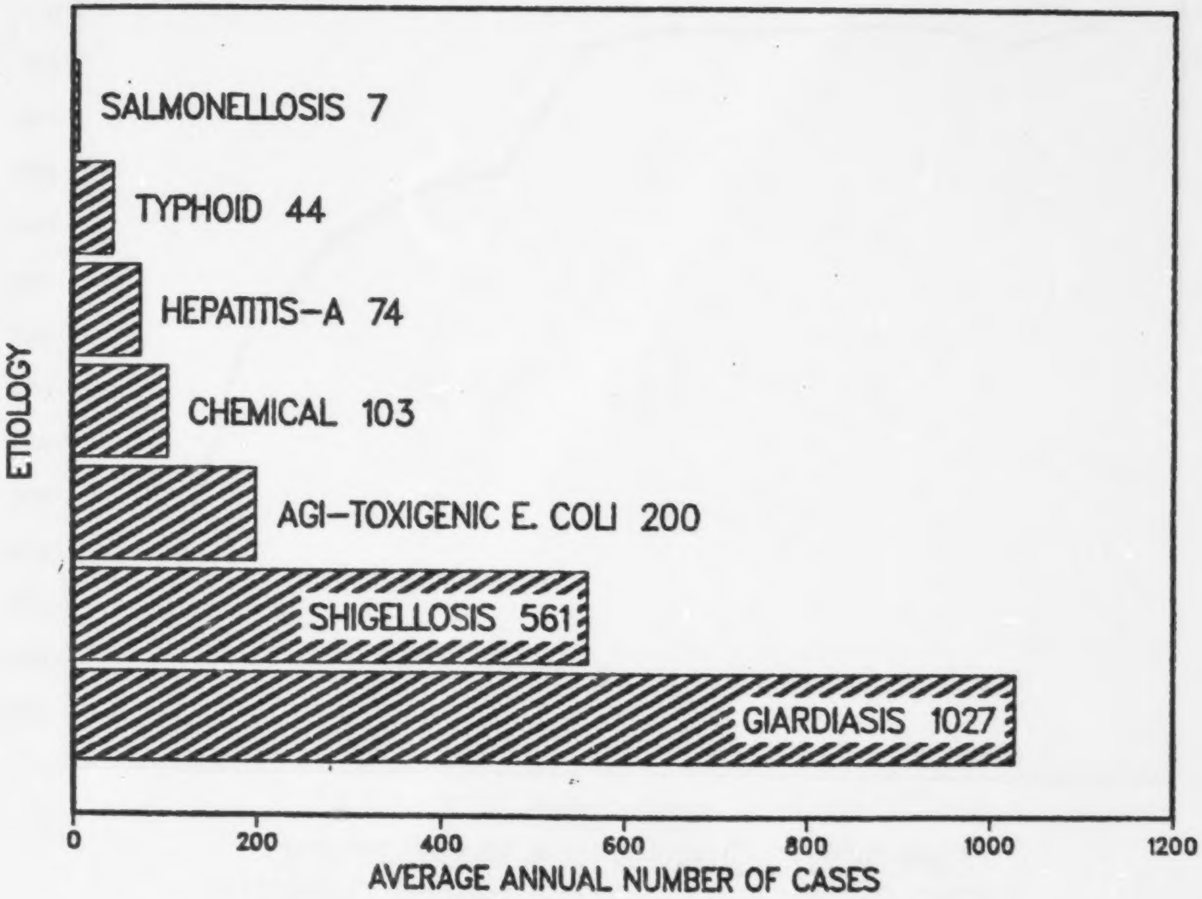
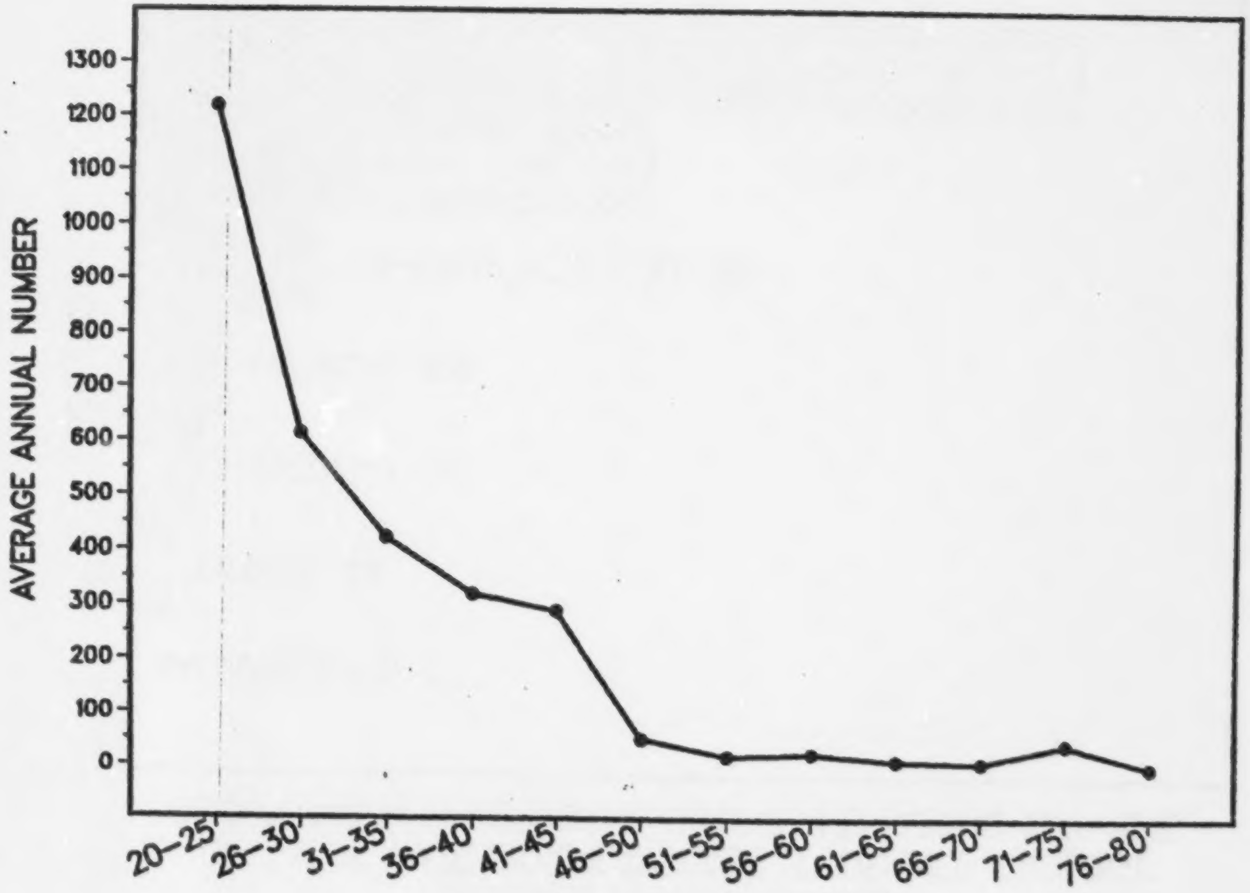
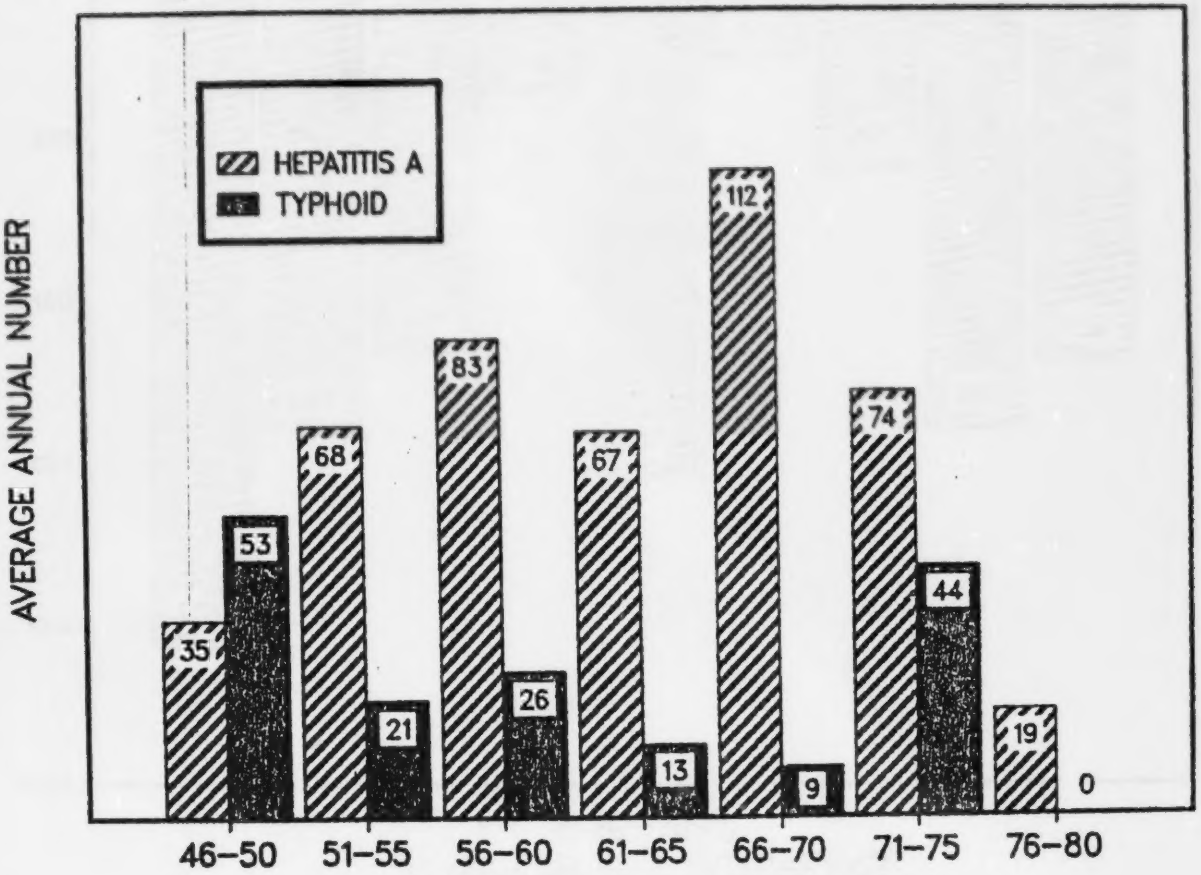
OCCURRING IN WATERBORNE OUTBREAKS DURING 1971–1975



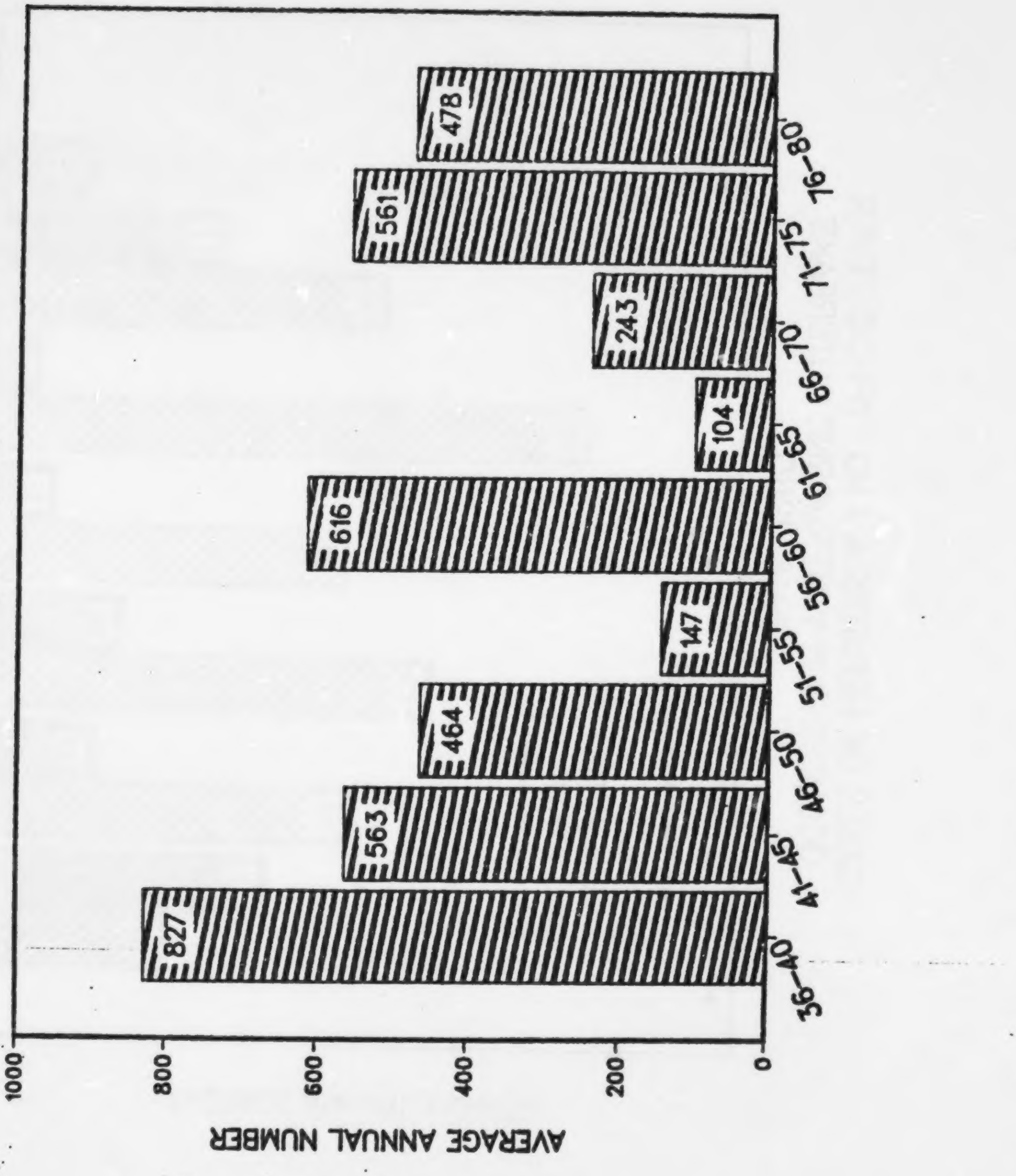
AVERAGE ANNUAL NUMBER OF TYPHOID CASES
OCCURRING IN WATERBORNE OUTBREAKS
1920–1980



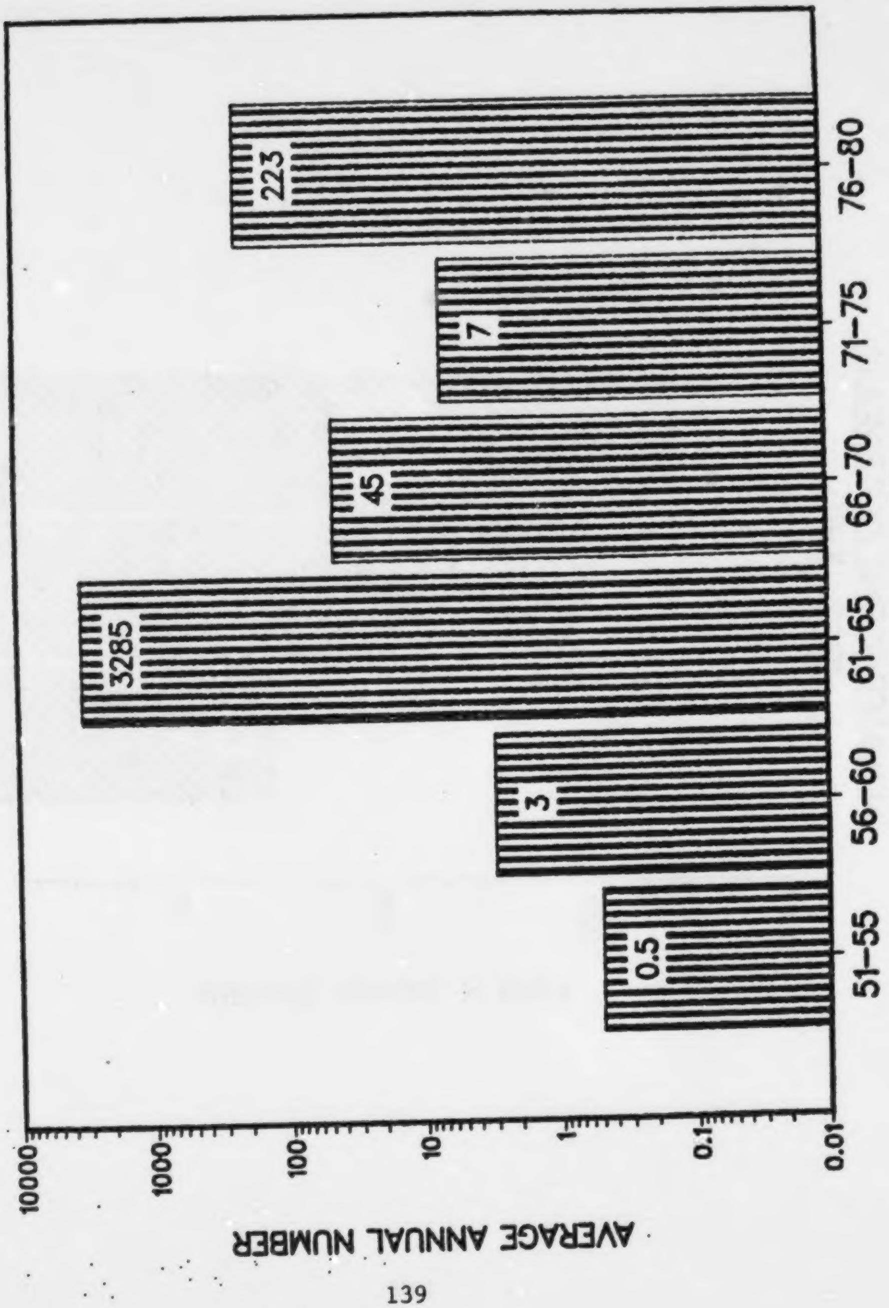
CASES OF HEPATITIS A AND TYPHOID FEVER OCCURRING IN WATERBORNE OUTBREAKS 1946–1980

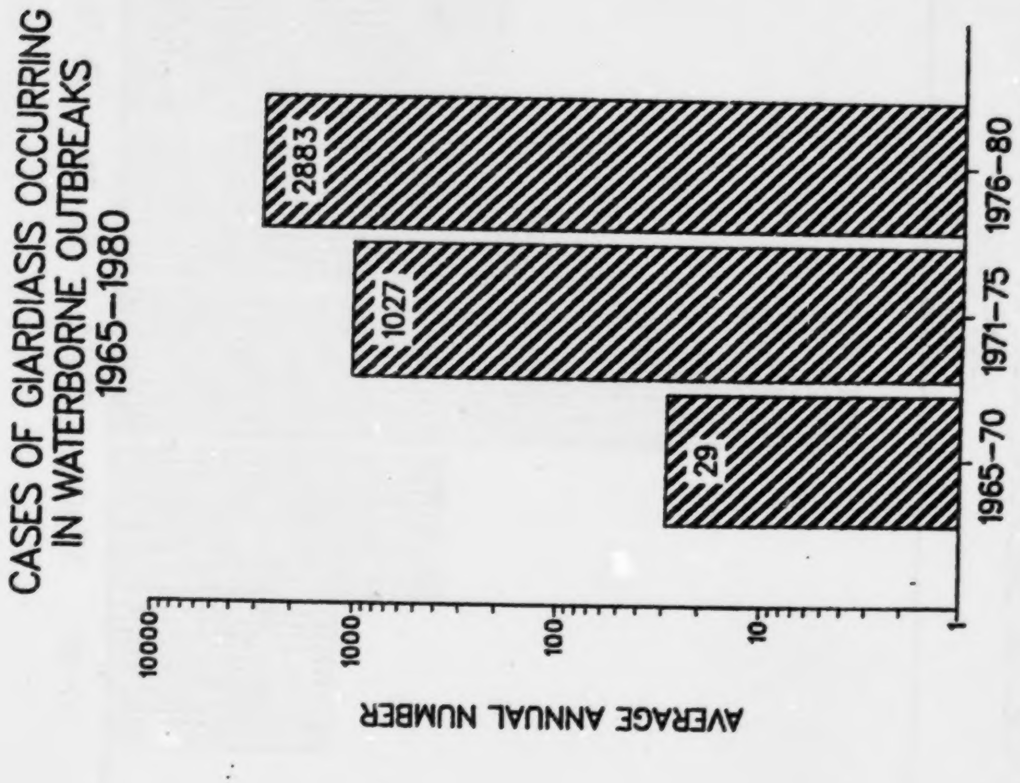


CASES OF SHIGELLOSIS OCCURRING IN WATERBORNE OUTBREAKS 1936–1980



CASES OF SALMONELLOSIS IN WATERBORNE OUTBREAKS
1951–1980





CASES OF GIARDIASIS OCCURRING IN WATERBORNE OUTBREAKS 1965–1980

LEGEND FOR WATER SYSTEM DEFICIENCIES

1 = Contaminated Untreated Surface Water

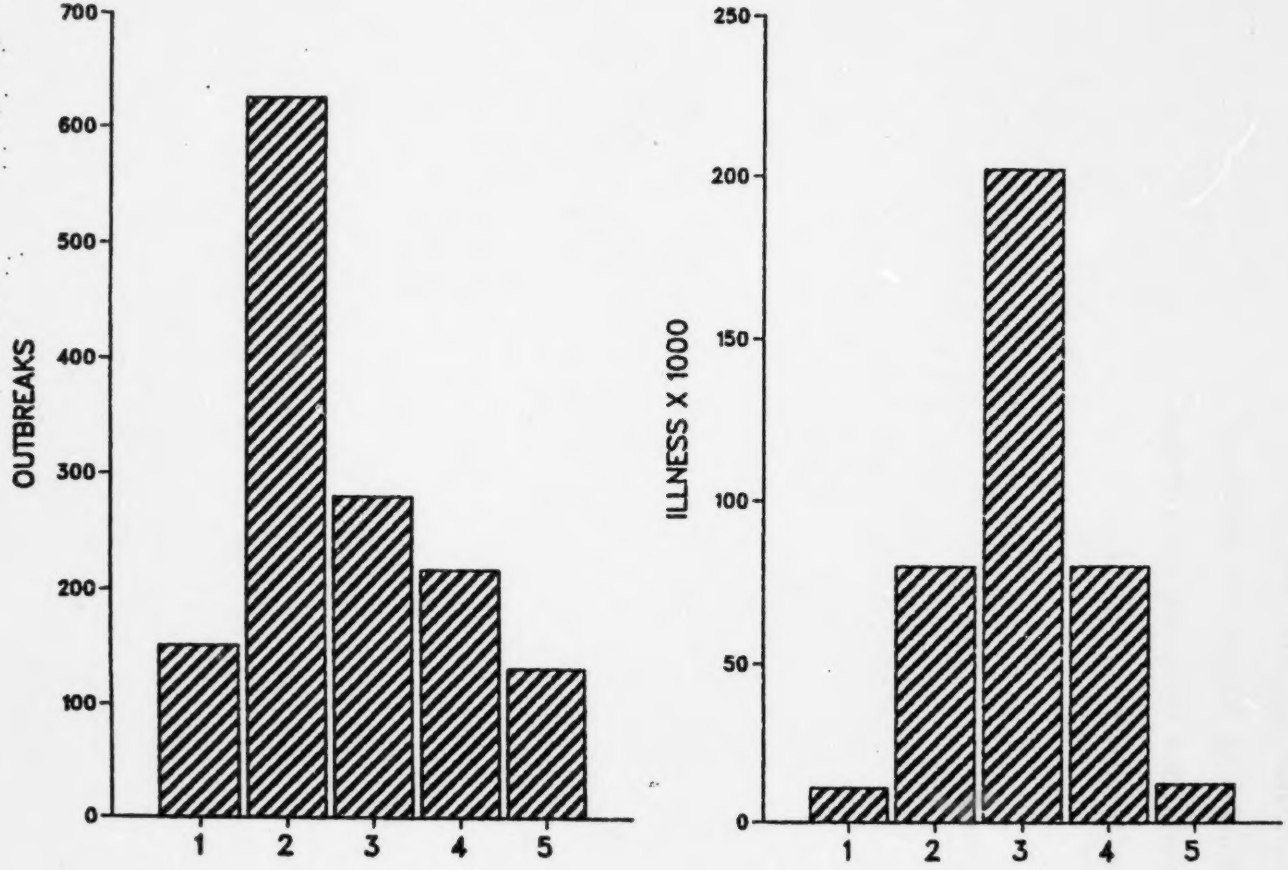
2 = Contaminated Untreated Groundwater

3 = Inadequate or Interrupted Treatment

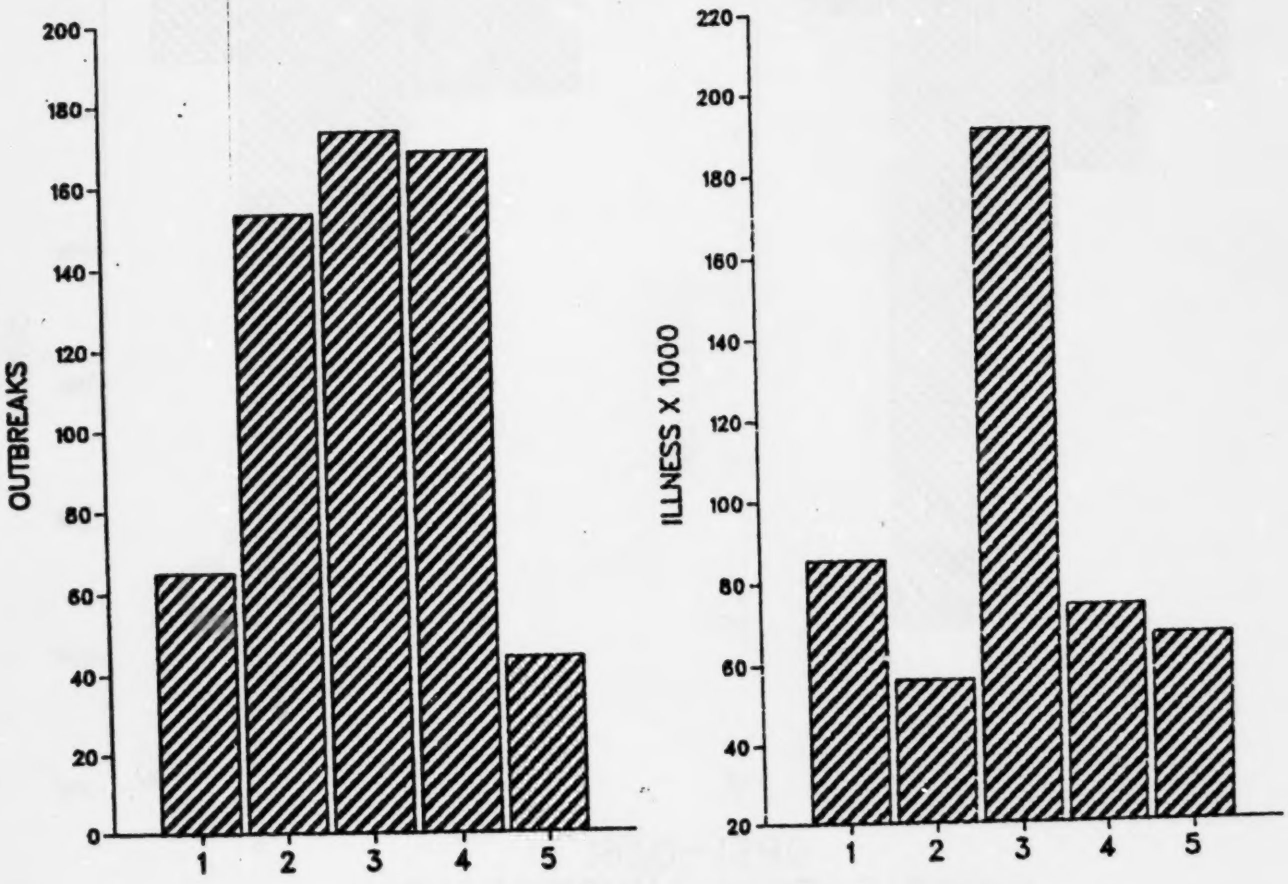
4 = Contamination of Distribution System

5 = Miscellaneous Deficiencies

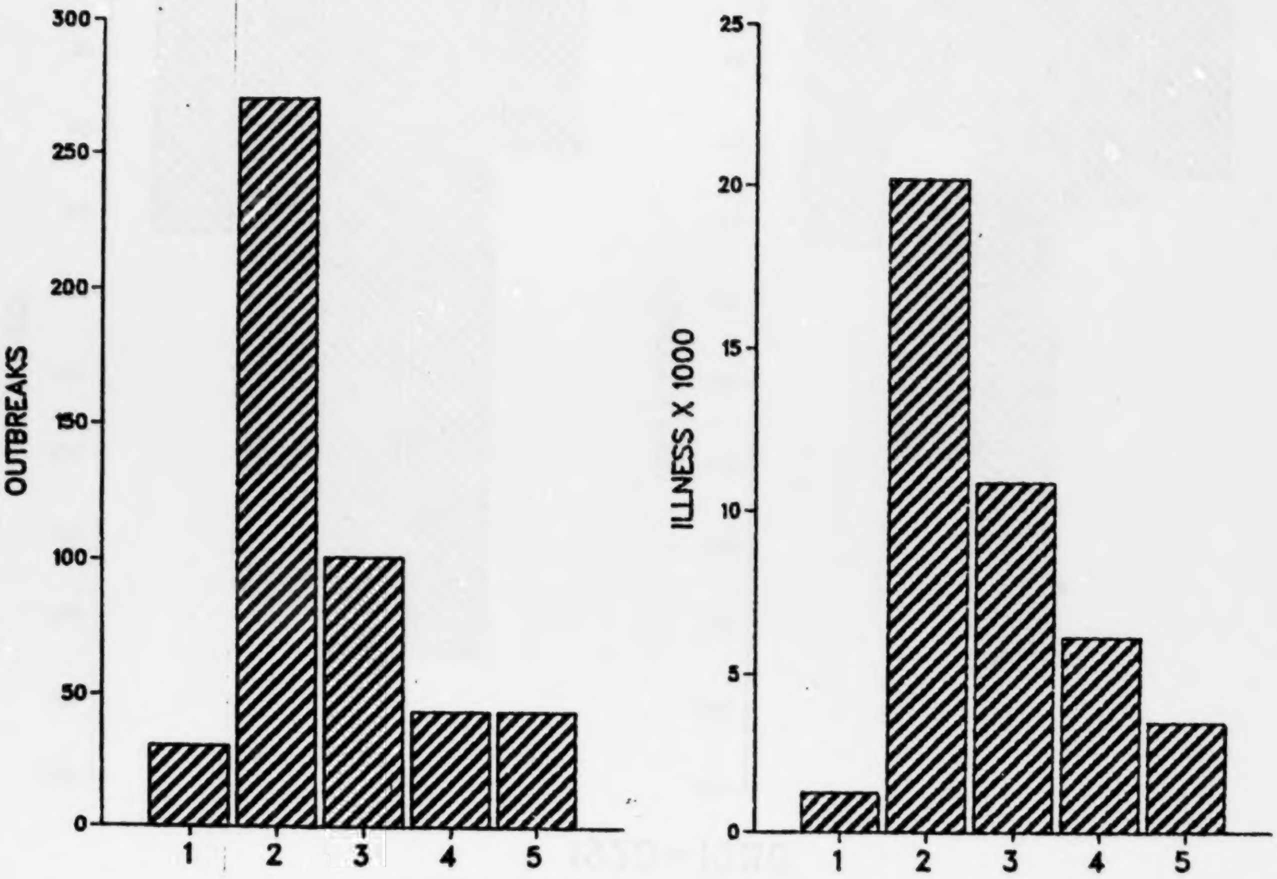
WATERBORNE OUTBREAKS BY WATER SYSTEM DEFICIENCY
ALL SYSTEMS
1920–1980



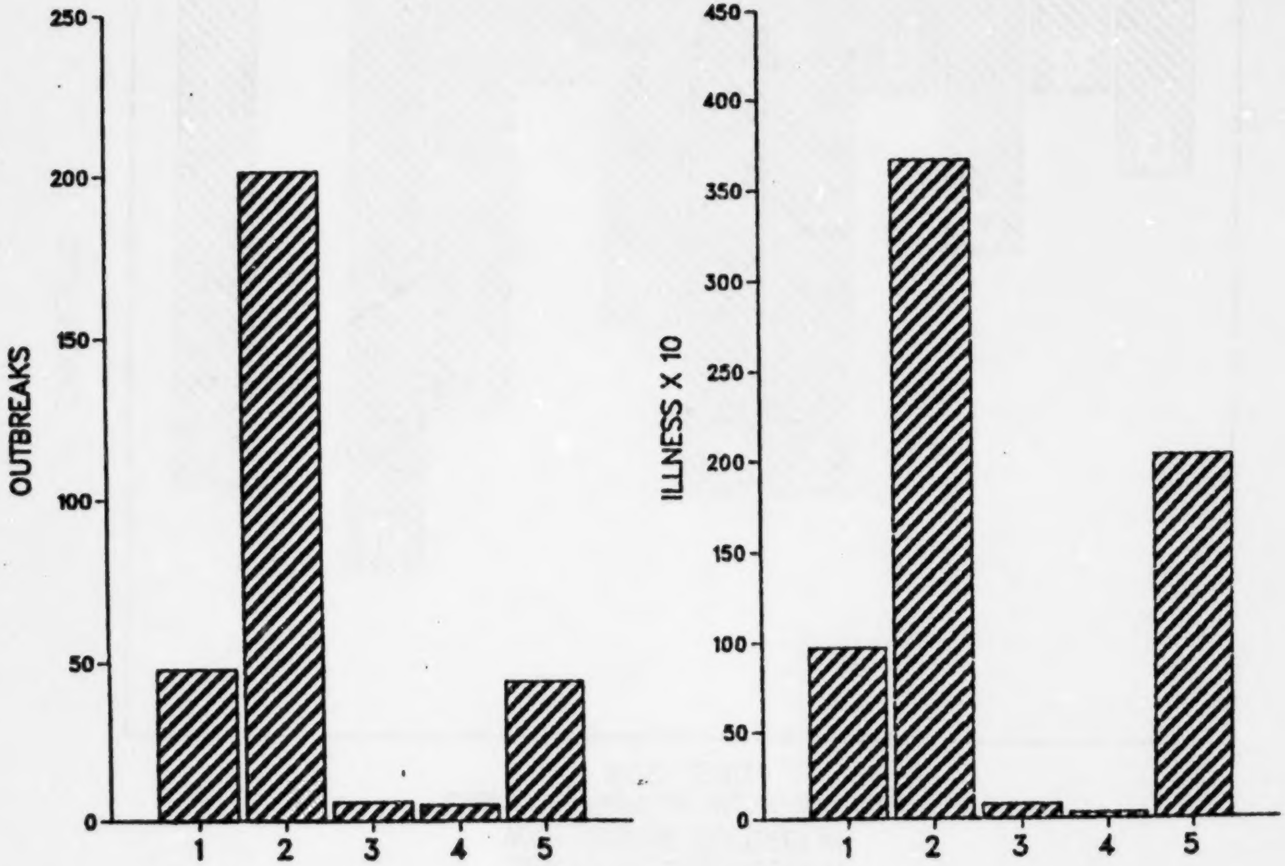
WATERBORNE OUTBREAKS BY WATER SYSTEM DEFICIENCY
COMMUNITY WATER SYSTEMS
1920–1980



WATERBORNE OUTBREAKS BY WATER SYSTEM DEFICIENCY
NONCOMMUNITY WATER SYSTEMS
1920–1980

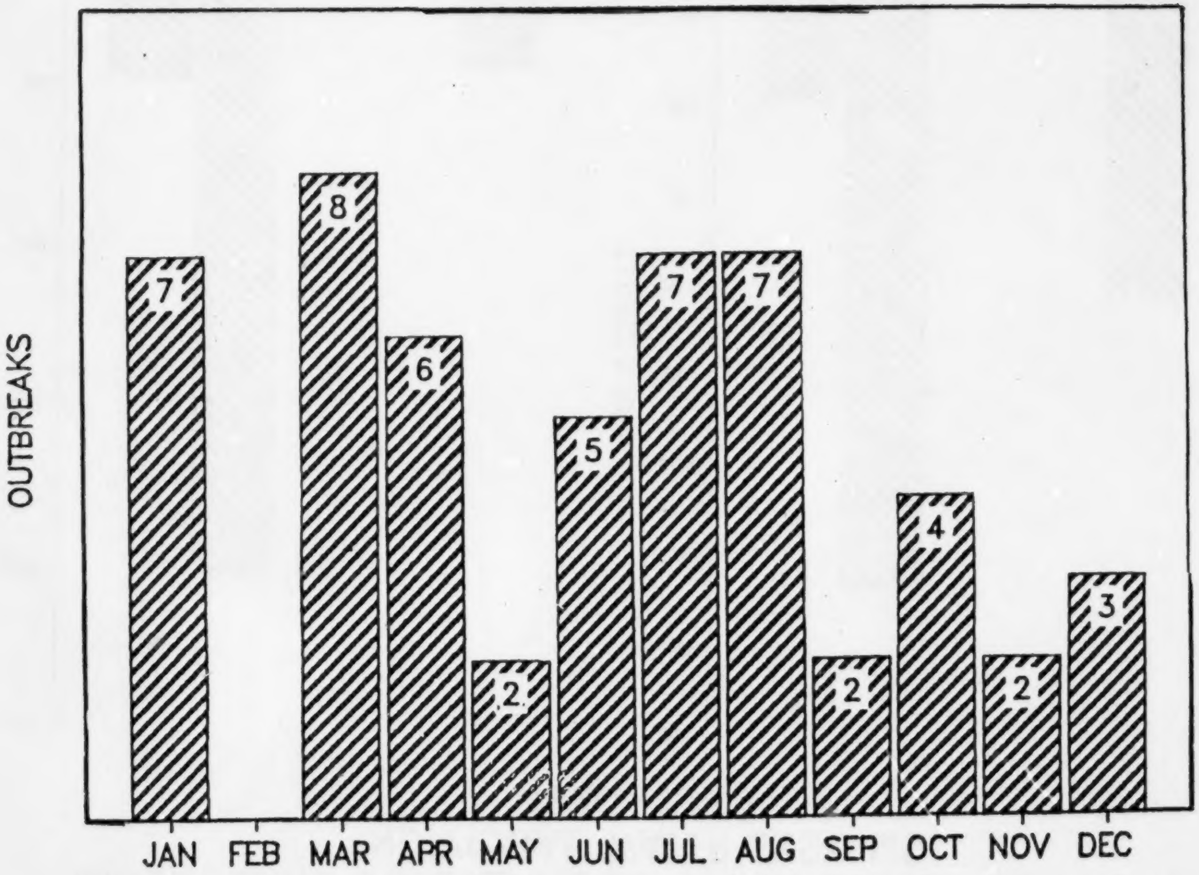


WATERBORNE OUTBREAKS BY WATER SYSTEM DEFICIENCY
INDIVIDUAL WATER SYSTEMS
1920–1980



COMMUNITY WATER SYSTEMS

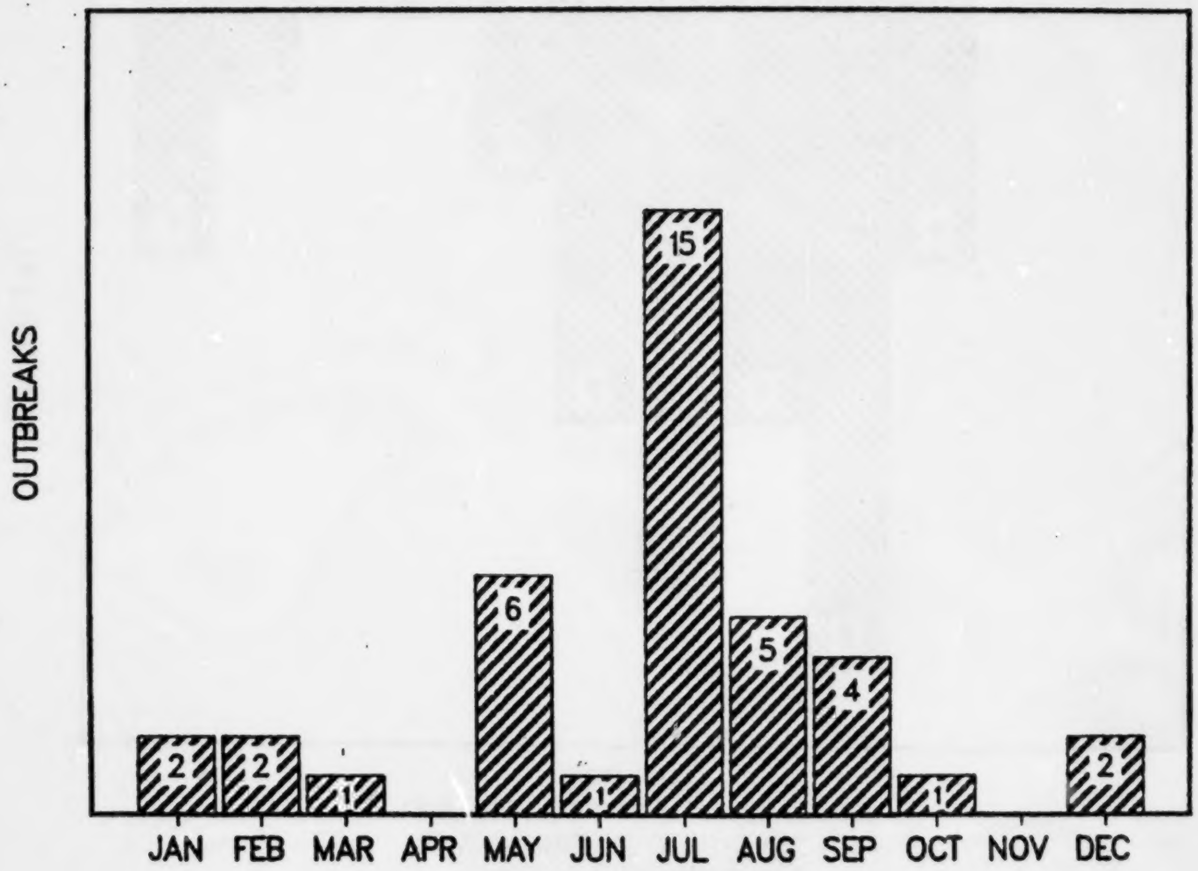
SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS
Untreated Surface Water Systems
1920–1980



NONCOMMUNITY WATER SYSTEMS

SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS

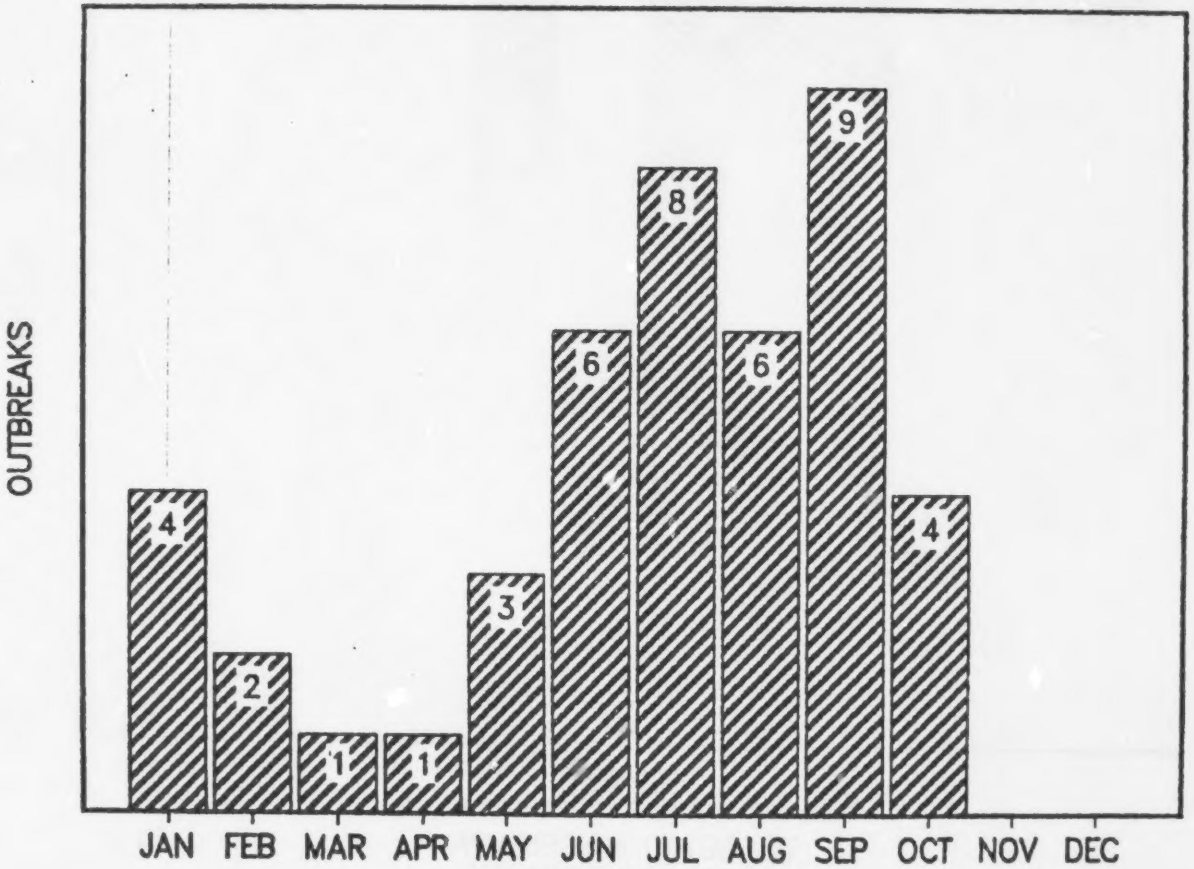
Untreated Surface Water Systems
1920–1980



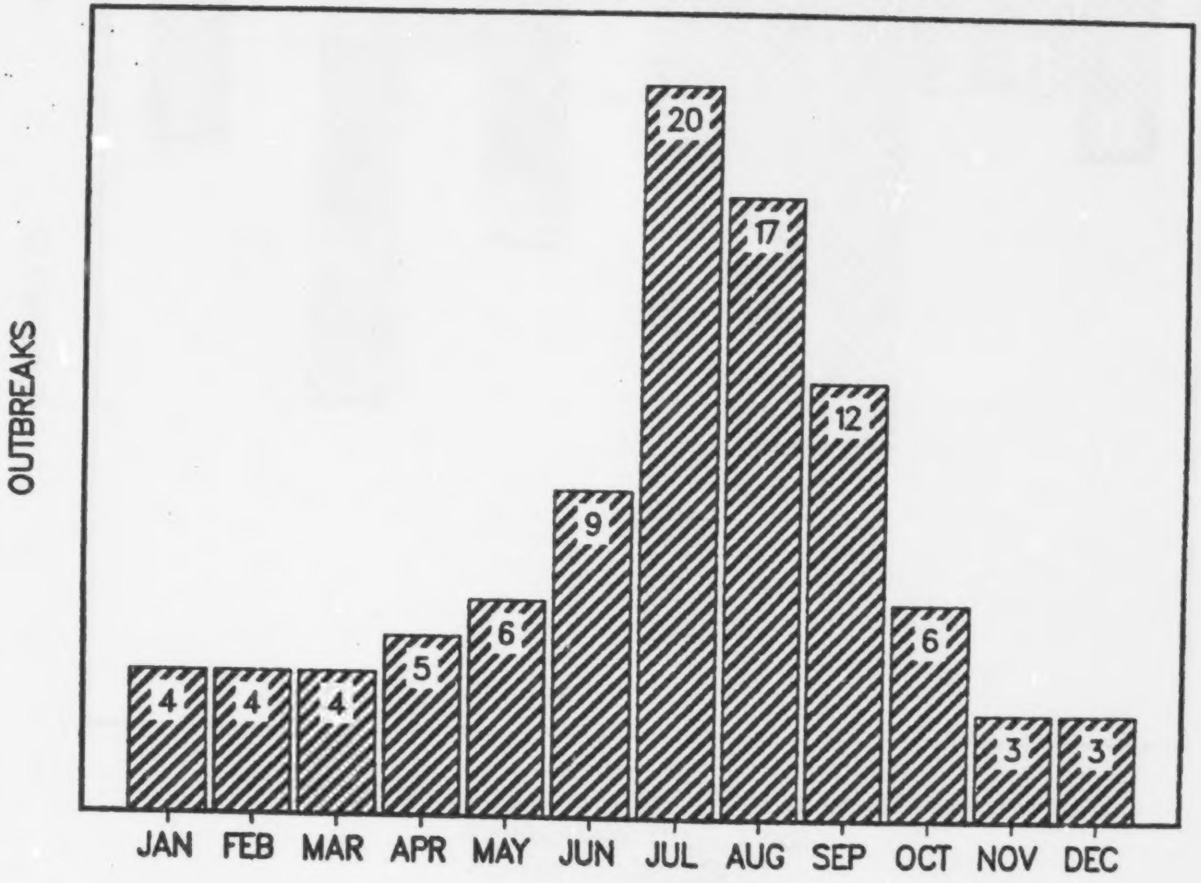
INDIVIDUAL WATER SYSTEMS

SEASONAL DISTRIBUTION WATERBORNE OUTBREAKS

Untreated Surface Water Systems
1920–1980



SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS
Untreated Groundwater Systems {Springs}
1920–1980



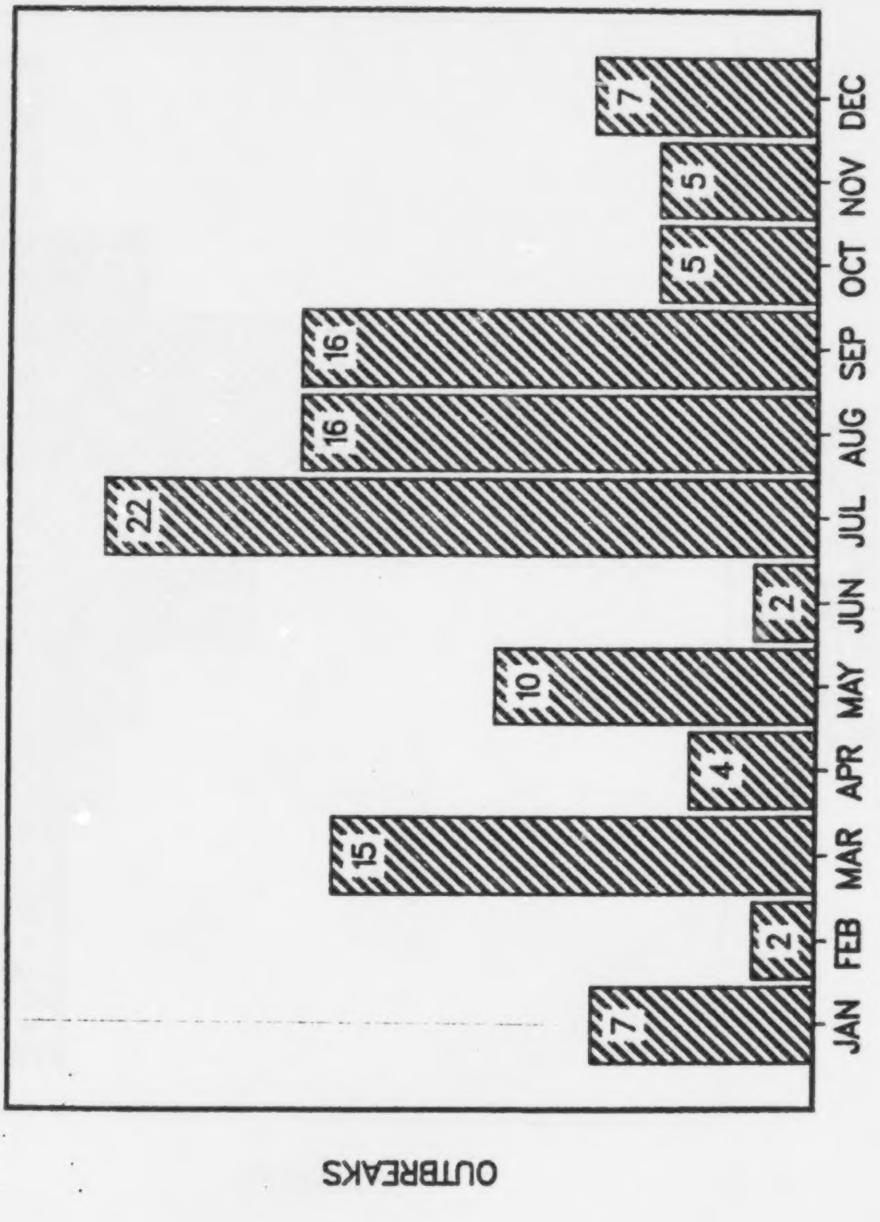
COMMUNITY WATER SYSTEMS

SEASONAL DISTRIBUTION

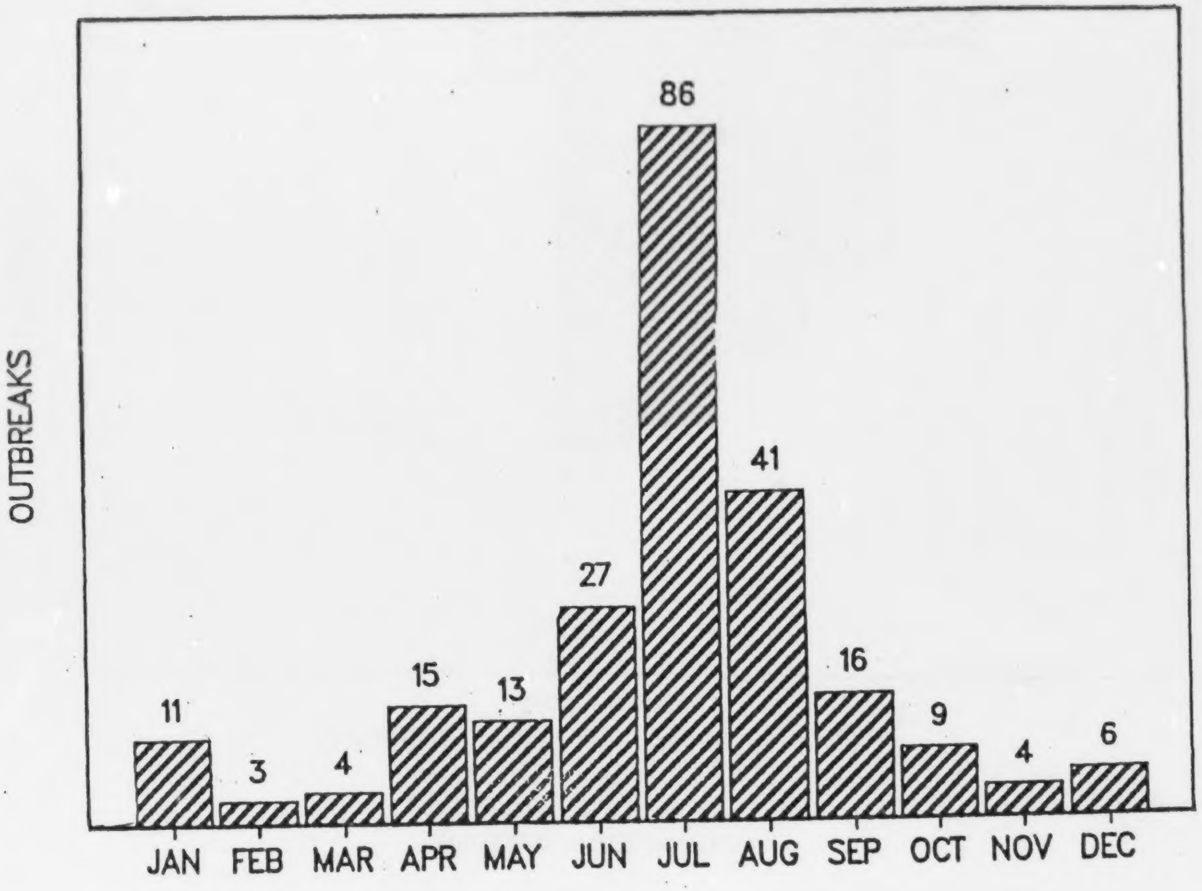
WATERBORNE OUTBREAKS

Untreated Groundwater Systems {Wells}

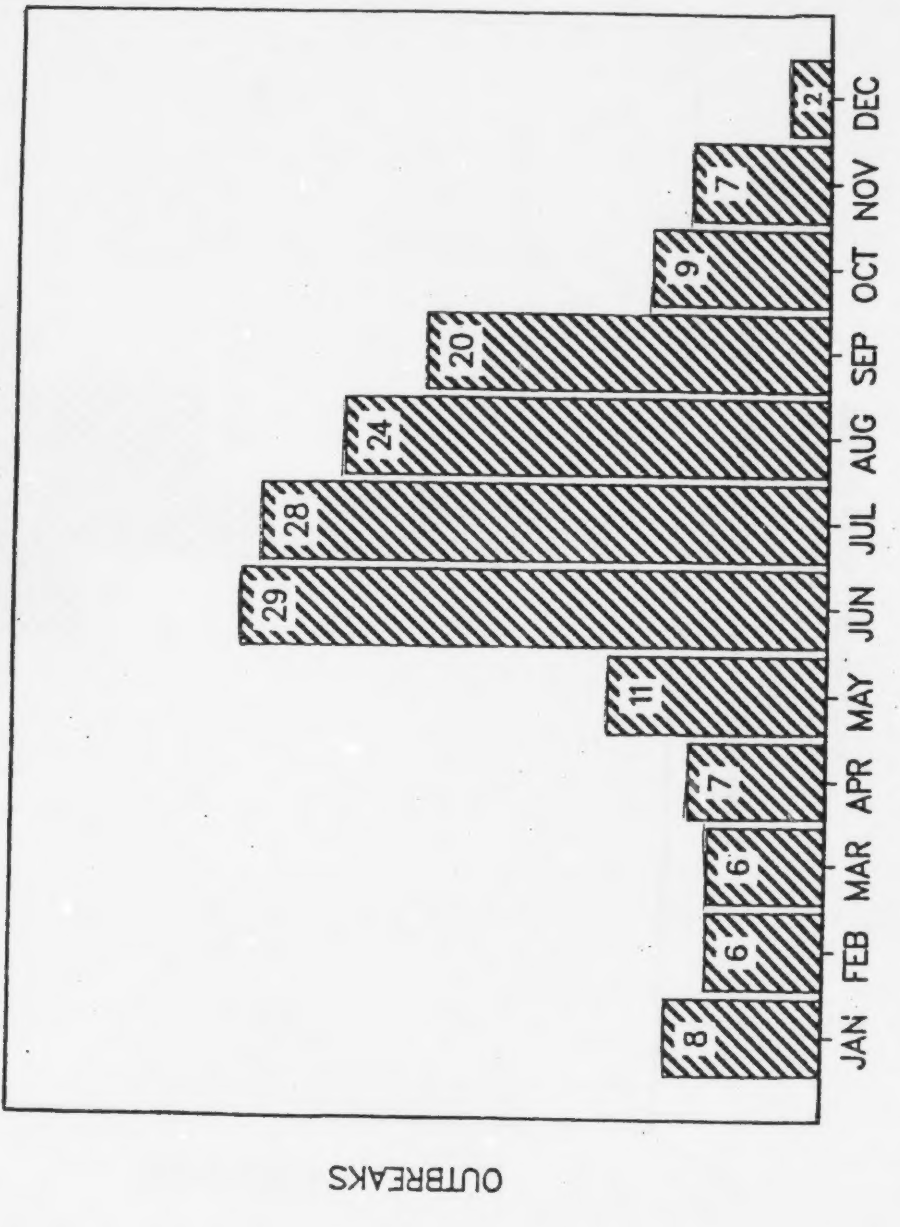
1920–1980



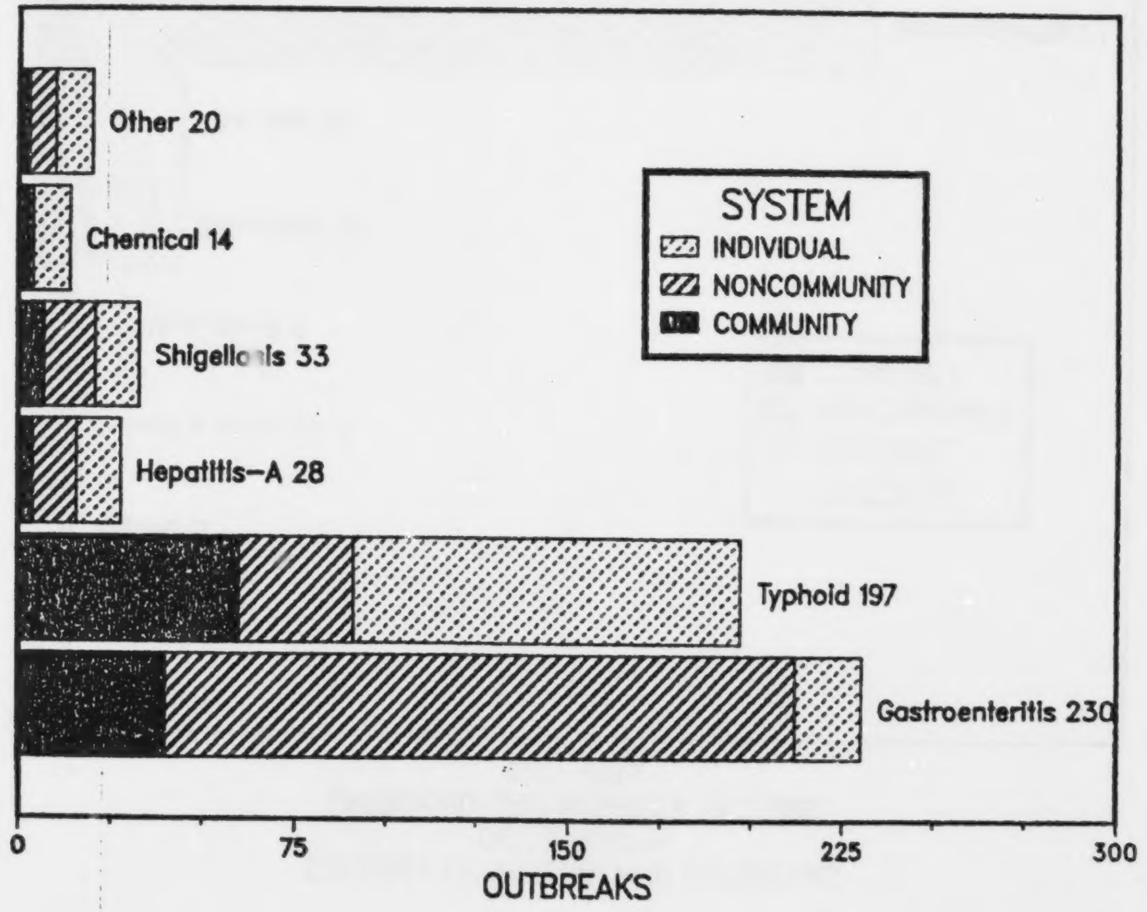
NONCOMMUNITY WATER SYSTEMS
SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS
Untreated Groundwater Systems {Wells}
1920–1980



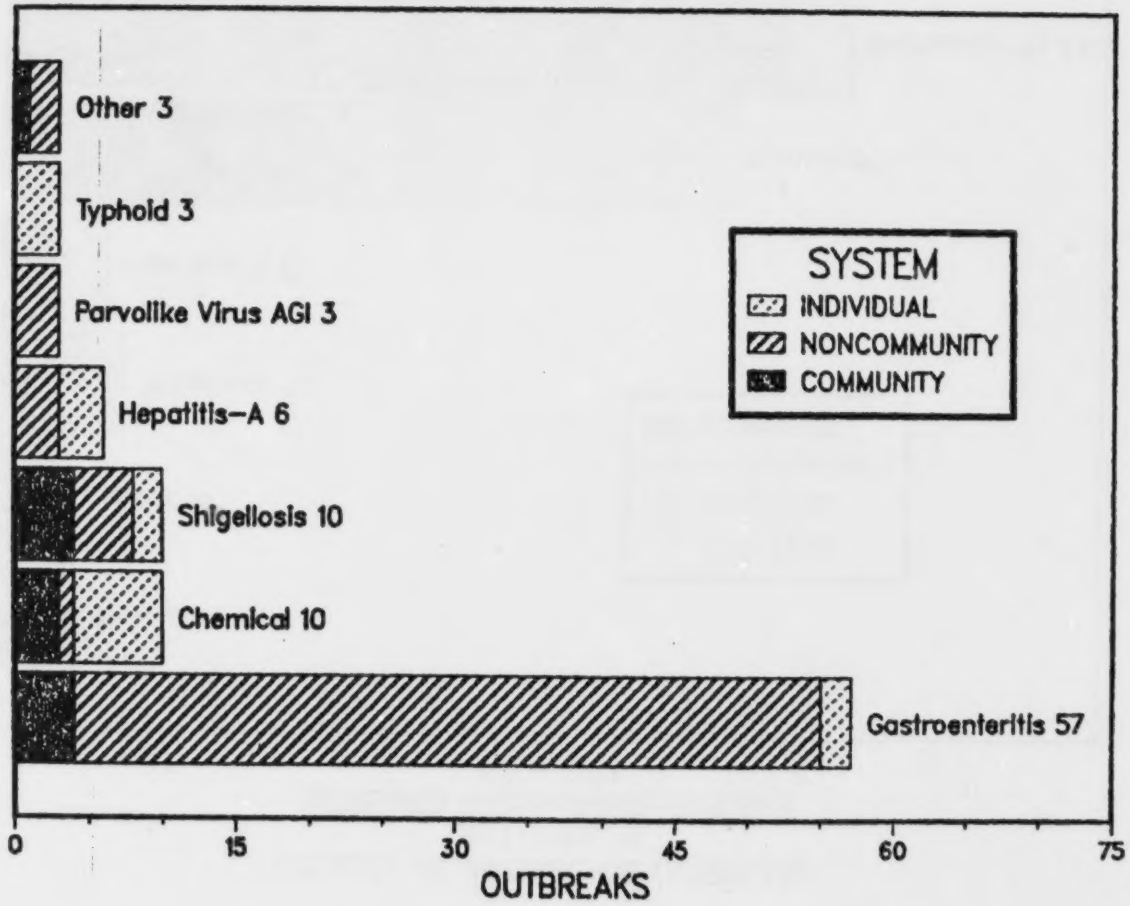
INDIVIDUAL WATER SYSTEMS
SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS
Untreated Groundwater Systems {Wells}
1920–1980



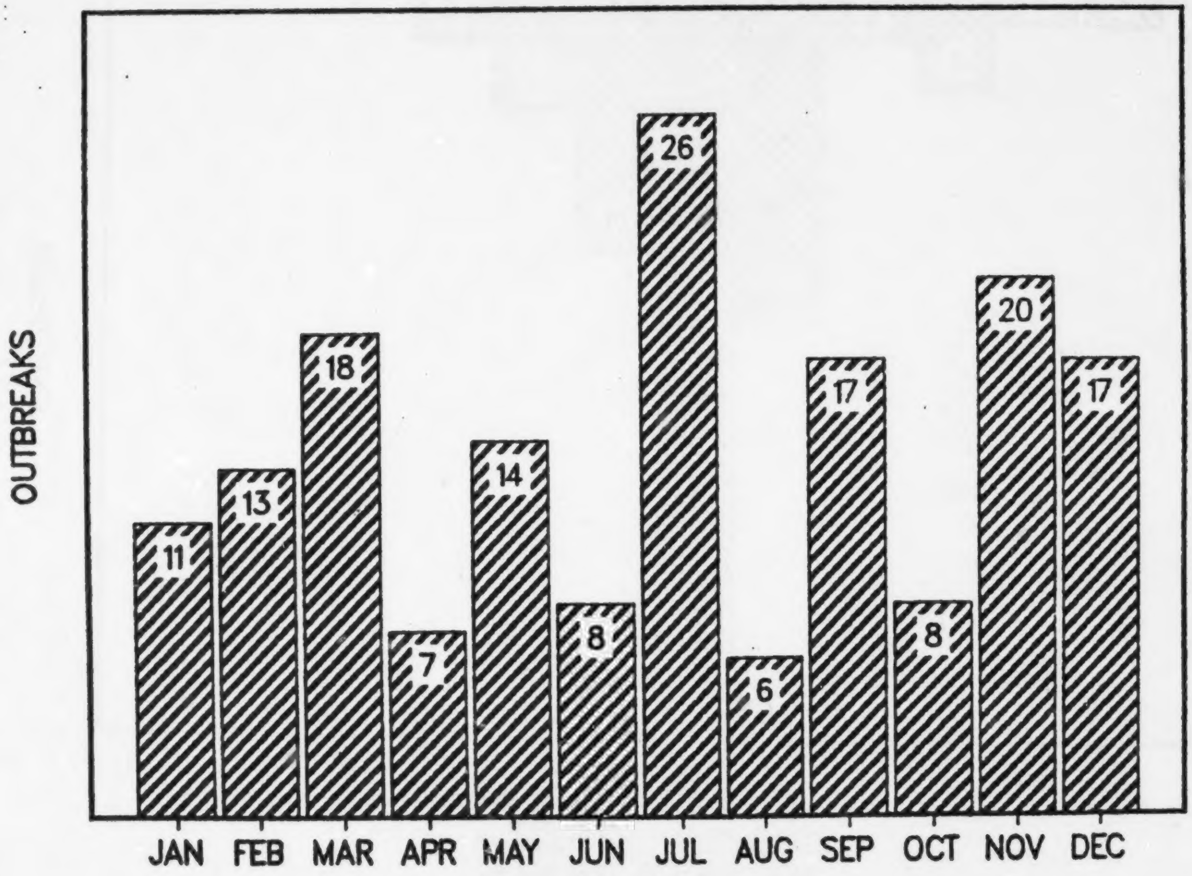
ETIOLOGY OF WATERBORNE OUTBREAKS
OCCURRING IN
UNTREATED GROUNDWATER SYSTEMS
1920–1980

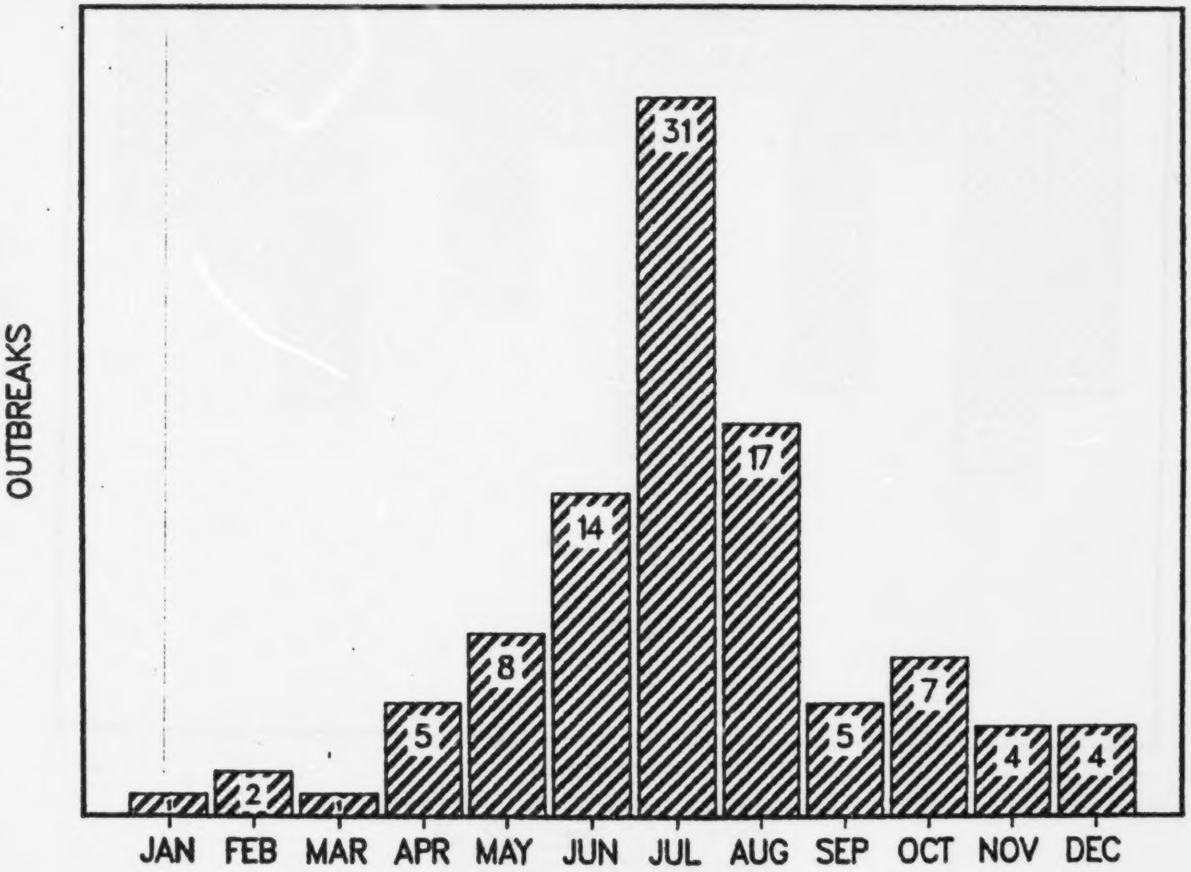


ETIOLOGY OF WATERBORNE OUTBREAKS
OCCURRING IN
UNTREATED GROUNDWATER SYSTEMS
1971–1980



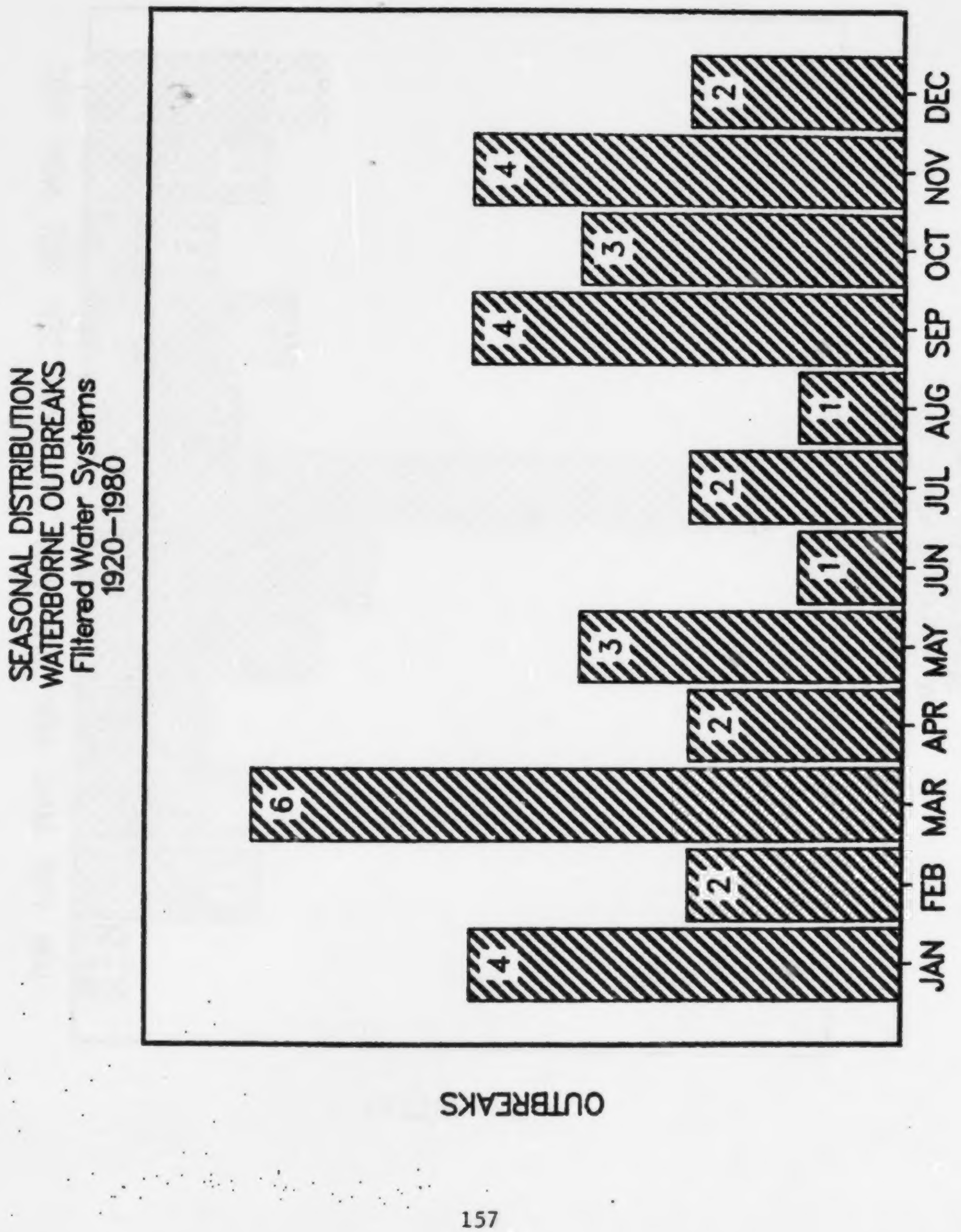
COMMUNITY WATER SYSTEMS
SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS
Caused By A Treatment Deficiency
1920–1980





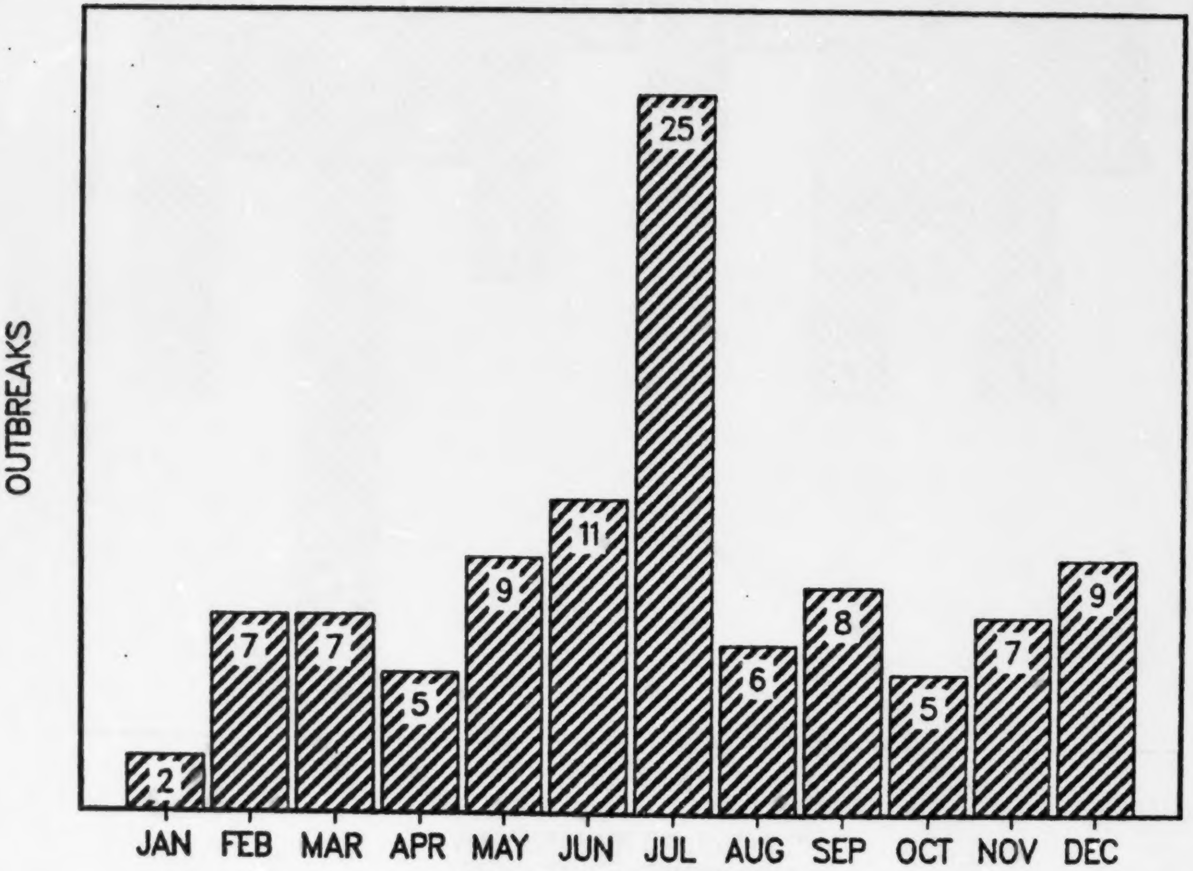
NONCOMMUNITY WATER SYSTEMS

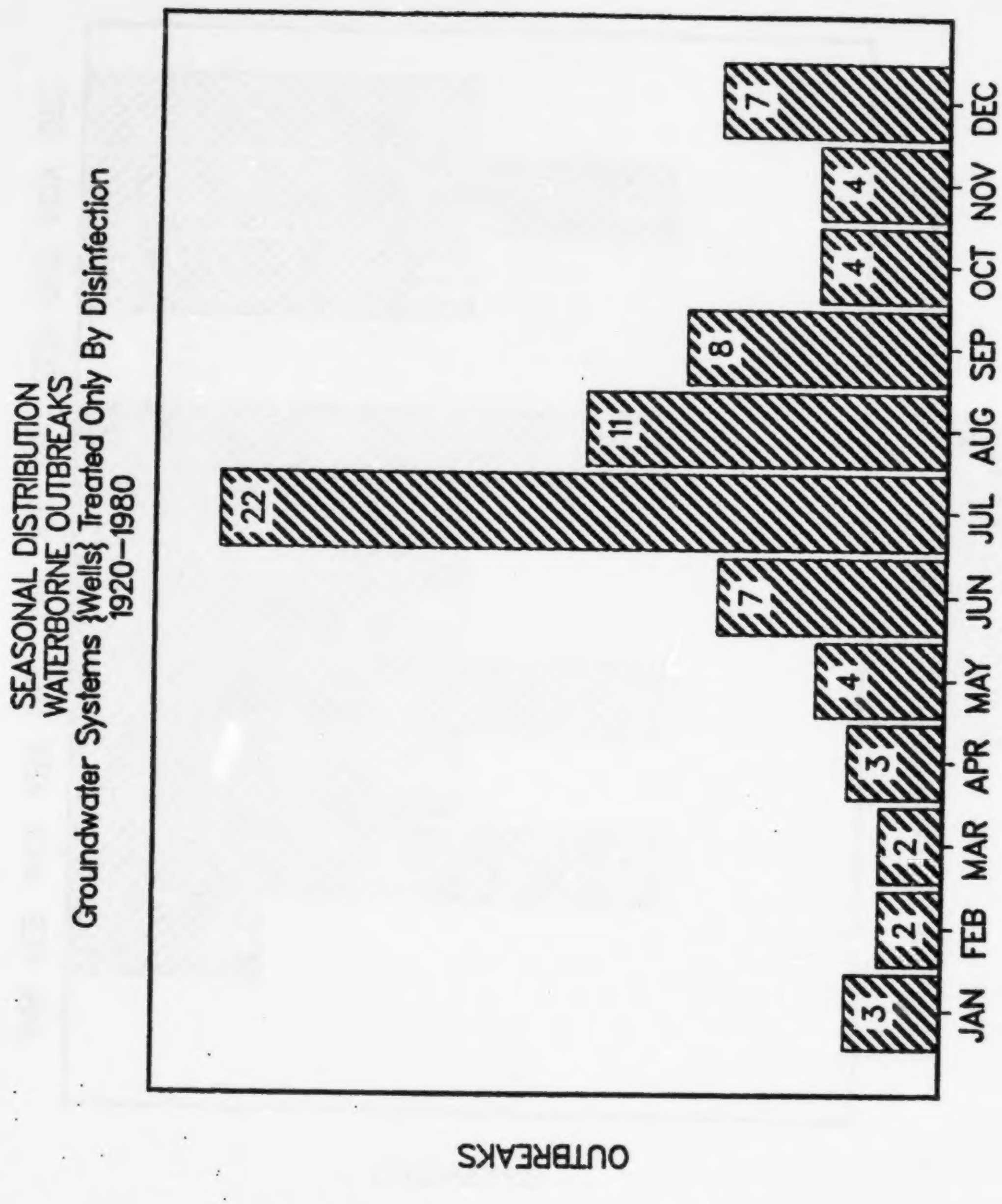
SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS
Caused By A Treatment Deficiency
1920–1980



SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS
Filtered Water Systems
1920–1980

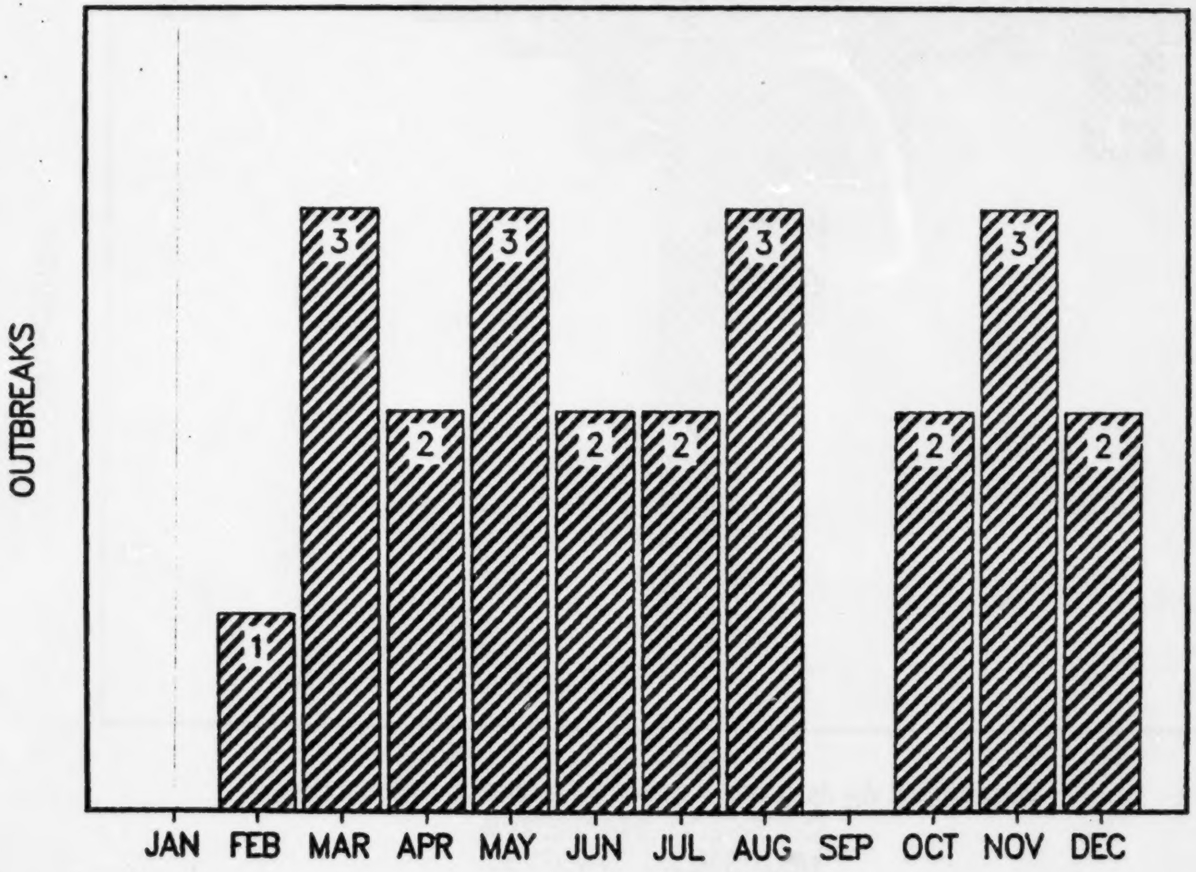
SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS
Surface Water Systems Treated Only By Disinfection
1920–1980



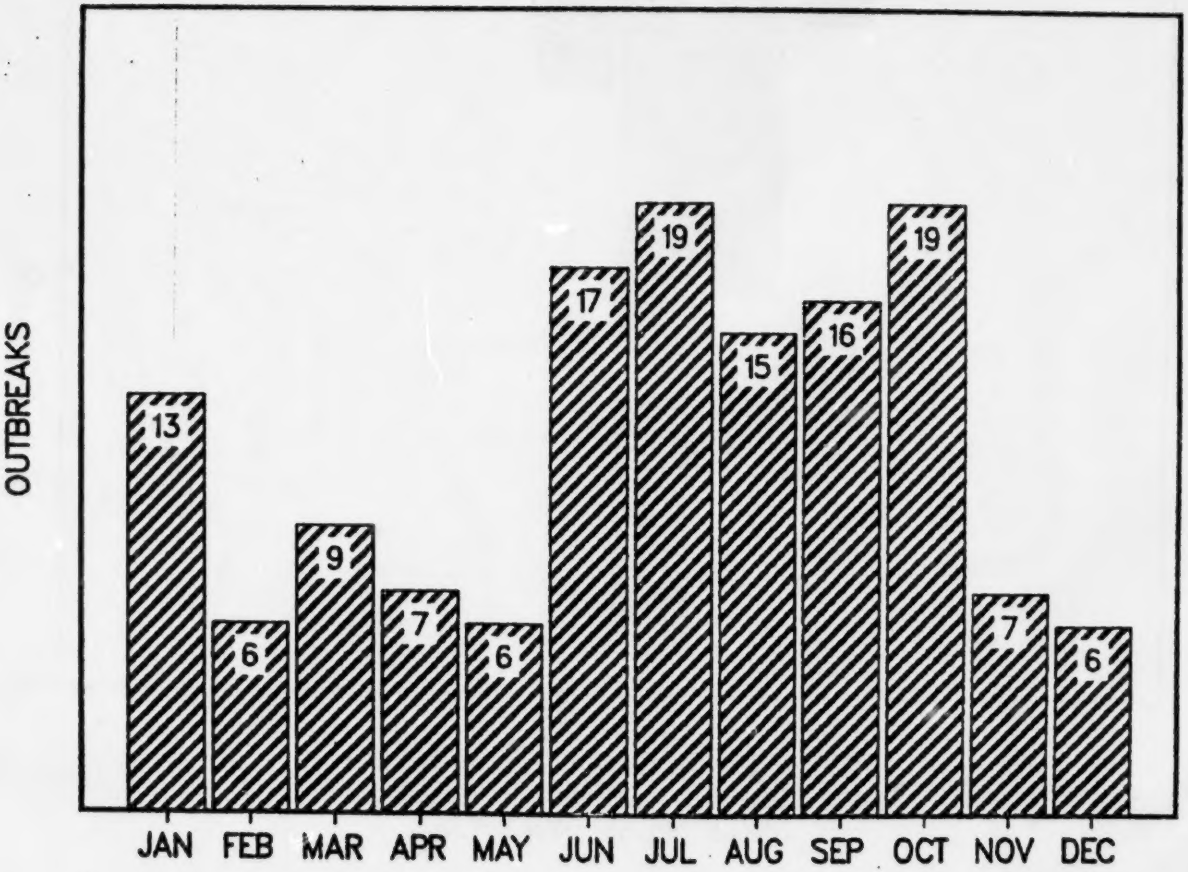


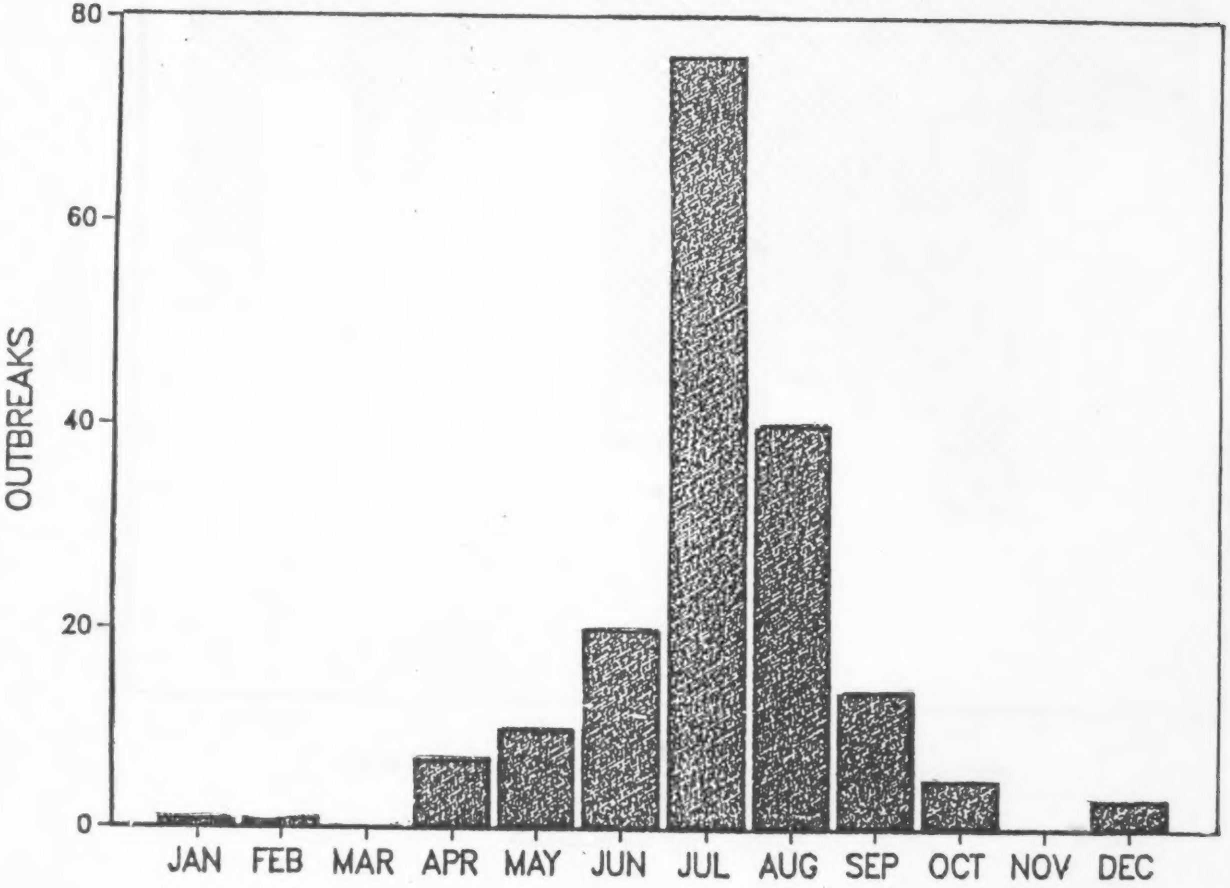
SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS
Groundwater Systems {Wells} Treated Only By Disinfection
1920–1980

SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS
Groundwater Systems {Springs} Treated Only By Disinfection
1920–1980



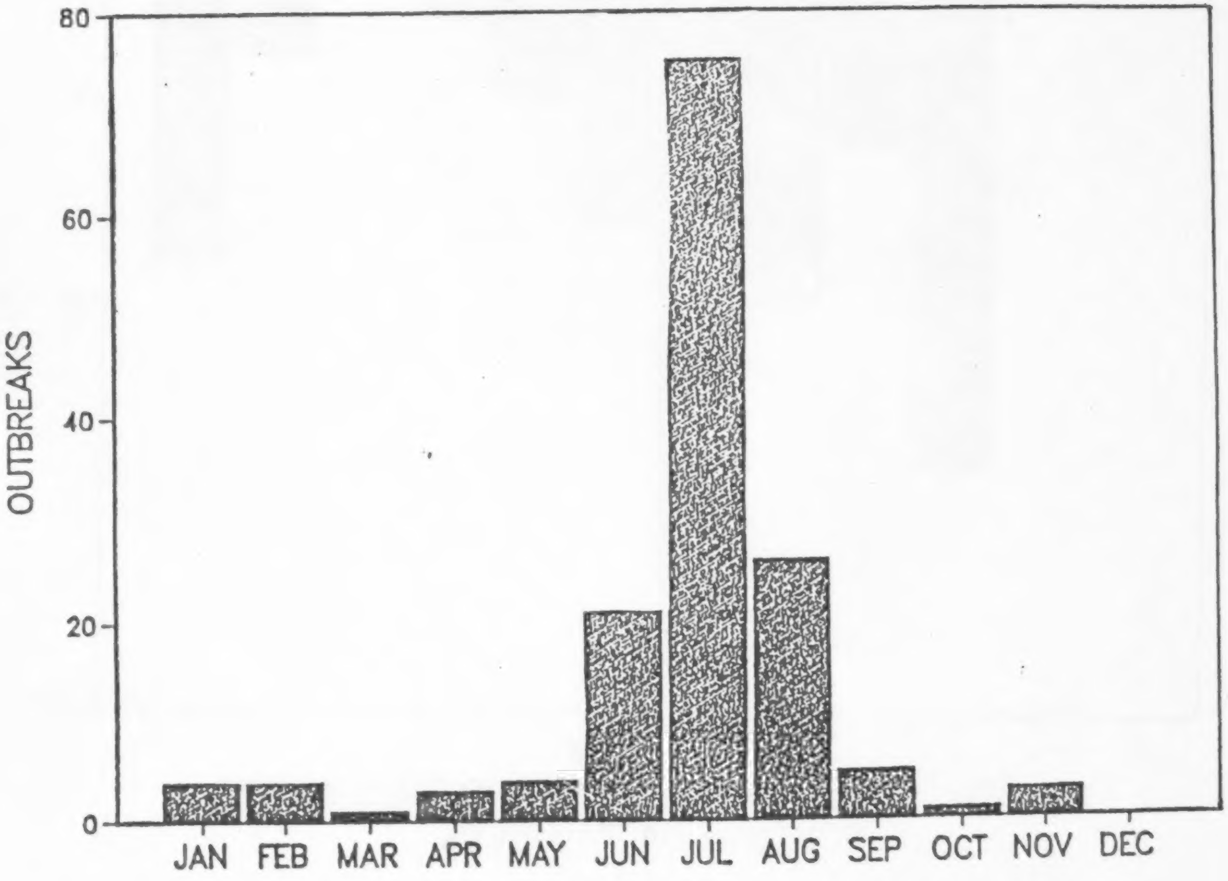
SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS
Caused By Crossconnections And Backsiphonage
1920–1980

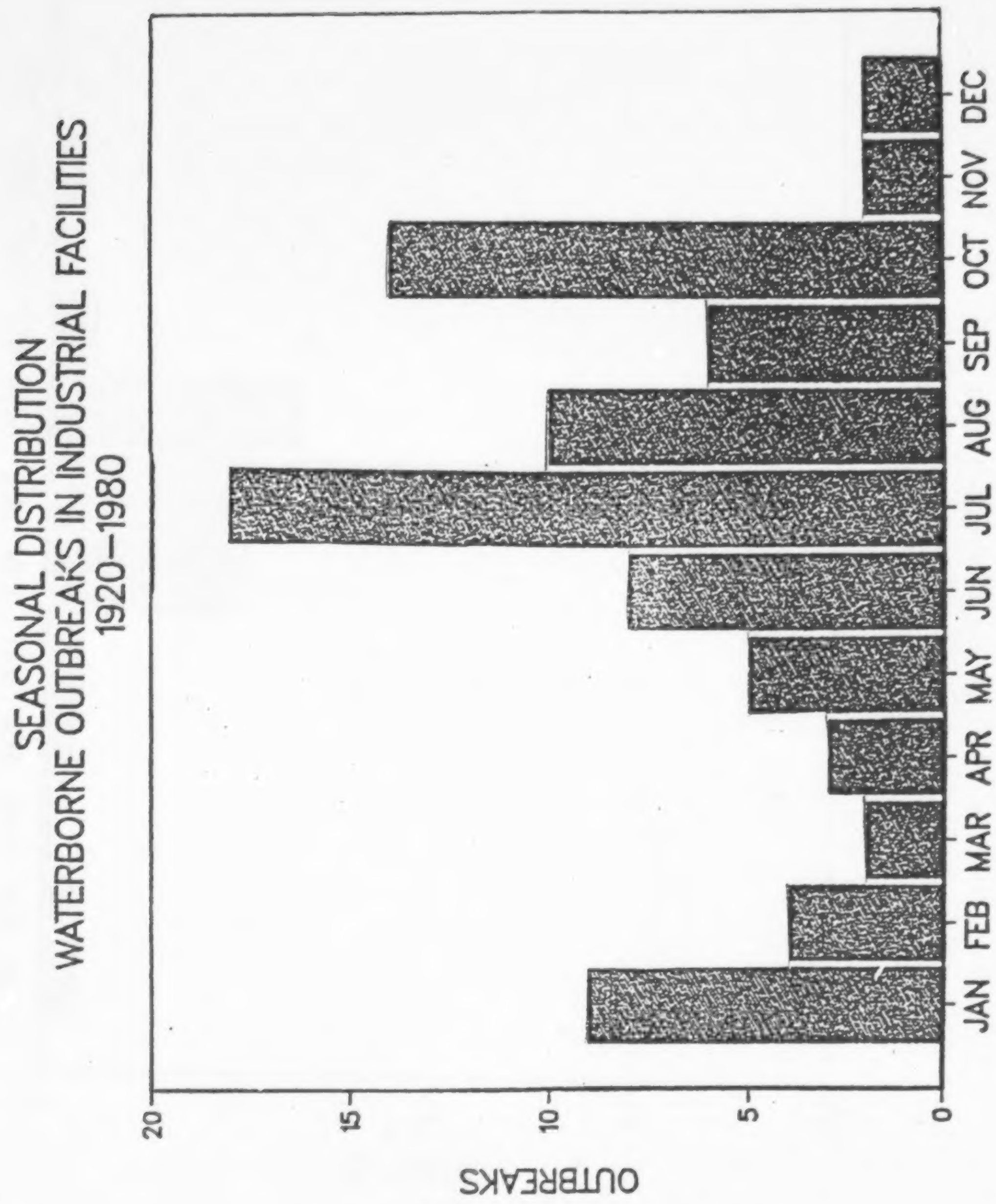




SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS ASSOCIATED WITH
CAMPS, PARKS, RECREATIONAL AREAS
1920–1980

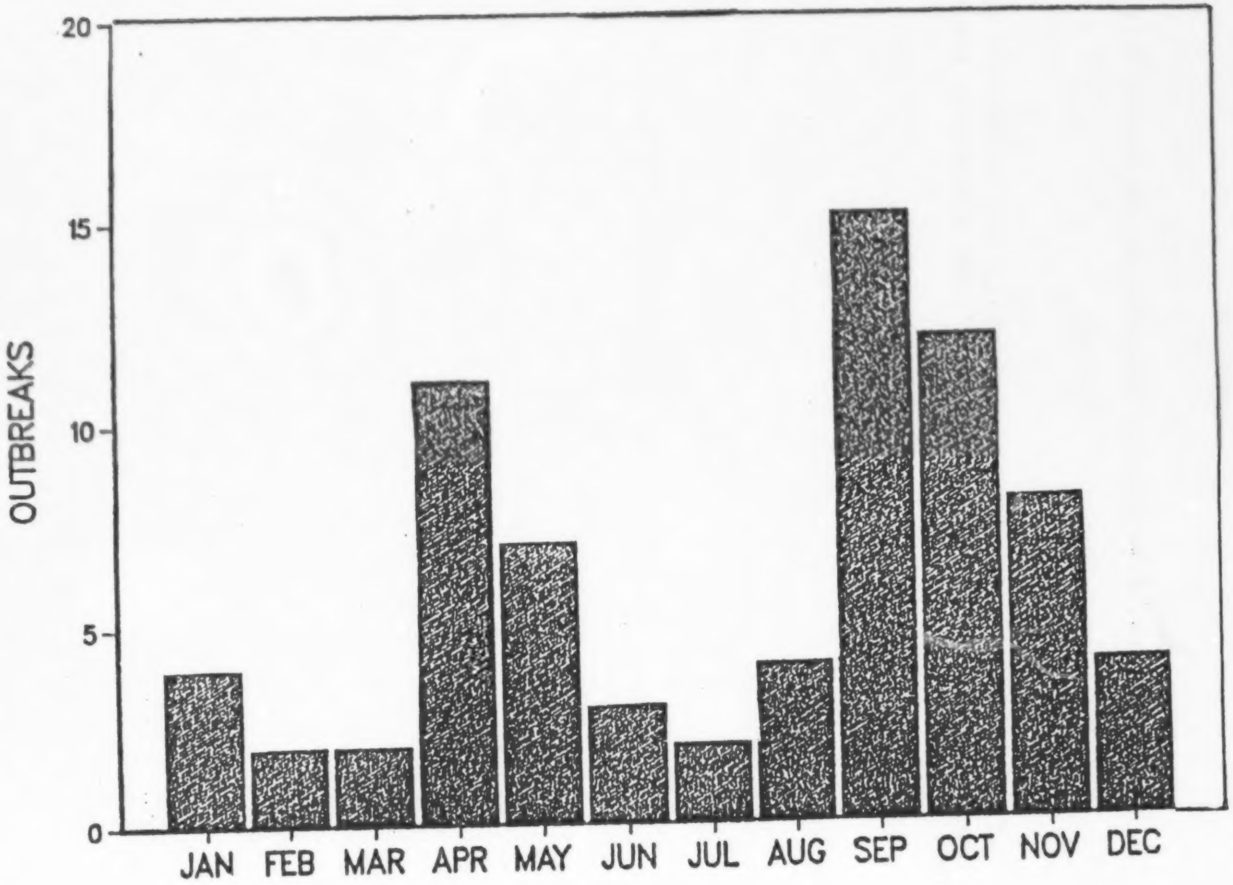
SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS IN
HOTELS, MOTELS, ROOMING HOUSES
1920–1980





SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS IN INDUSTRIAL FACILITIES
1920–1980

SEASONAL DISTRIBUTION
WATERBORNE OUTBREAKS IN SCHOOLS
1920–1980



APPENDIX

Statistics of Waterborne Outbreaks in the United States

1920-80

The raw statistical data referred to in this manuscript served as an integral basis for the research reported and, therefore, are included in this Appendix.

TABULATION OF 1405 WATERBORNE OUTBREAKS
REPORTED IN THE UNITED STATES 1920-1980

BY

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ARTHUR F. HAMMONDS
STEVEN C. WALTRIP

U. S. ENVIRONMENTAL PROTECTION AGENCY

CINCINNATI, OHIO 45268

MAY 1983

ALABAMA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY, DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1920	9	GADSDEN		35	TYPHOID	.	
1921	12	TALLADEGA		25	TYPHOID	.	
1923	3	TALLADEGA		17	TYPHOID	.	
1924	9	HUNTSVILLE		17	TYPHOID	.	
1934	7	DECATUR		46	TYPHOID	.	
1934	7	PHENIX CITY		44	TYPHOID	.	
1938	6	LEE CO.		4	TYPHOID	.	
1941	3	GADSEN		10000	GASTROENTERITIS	.	
1950	.	JEFFERSON CO.	SCHOOL	500	GASTROENTERITIS	.	
1953	8	ANNISTON	SCHOOL	450	SHIGELLA FLEXNERI	.	
1958	11	CENTER POINT	SCHOOL	6	GASTROENTERITIS	.	
1961	3	COLLINSVILLE		600	GASTROENTERITIS	.	
1968	9	LIMESTONE CO.	SCHOOL	21	HEPATITIS A VIRUS	.	
1971	.	CHAMBERS CO.		3	SELENIUM	.	
1972	10	COLBERT CO.	SCHOOL	50	HEPATITIS A VIRUS	.	
1972	8	JEFFERSON CO.		9	HEPATITIS A VIRUS	.	
1973	2	STEELE		50	HEPATITIS A VIRUS	.	

ALASKA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1946	5	KENAI		14	SHIGELLA PARADYSENTE	.	
1947	5	NENONA		4	TYPHOID	.	
1954	.	KETCHIKAN		2	SALMONELLA	.	
1955	.	KOTZEBUE		21	HEPATITIS A VIRUS	.	
1963	1	EKUK		2	TYPHOID	.	
1967	10	BARROW		35	TOXIGENIC E. COLI	.	
1967	10	KODIAK	TRAILER PARK	5	TOXIGENIC E. COLI	.	
1969	10	EMMONAK		33	SHIGELLA FLEXNERI	.	
1970	5	TULUKSAK		40	SHIGELLA FLEXNERI	.	
1971	11	ANCHORAGE	TRAILER PARK	89	SHIGELLA SONNEI	.	
1972	3	CORDOVA		400	GASTROENTERITIS	.	
1973	7	OLDHARBOR		50	SHIGELLA	.	
1974	7	JUNEAU	TRAILER PARK	34	SALMONELLA	.	
1976	8			25	SHIGELLA FLEXNERI	.	
1977	7	BETHEL	TRAILER PARK	7	SALMONELLA	.	
1980	9	DUTCH HARBOR	BARGE	189	GIARDIA	.	

ARIZONA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1920	6	PRESCOTT		20	TYPHOID	.	
1929	1		INDUSTRY	60	TYPHOID	350	GASTROENTERITIS
1965	12	TUCSON		36	GASTROENTERITIS	.	
1967	7	SUPAI	INDIAN RESERVATION	24	SHIGELLA	.	
1969	6	SUPAI	CAMPERS	26	SHIGELLA SONNEI	.	
1970	5	CUCOPAH INDIAN RES.	INDIAN RESERVATION	25	E. HISTOLYTICA	.	
1970	10	SUPAI	INDIAN RESERVATION	4	HEPATITIS A VIRUS	.	
1973	6	FT HURACUCA		2	SHIGELLA	.	
1979	8	ALPINE	CAMP	6	GASTROENTERITIS	.	
1979	9	CHANDLER	HOTEL	4	GASTROENTERITIS	.	
1979	6	LAKE HAVASU	RESTAURANT	2000	GIARDIA	.	
1979	9	TUCSON		14	SHIGELLA	.	

ARKANSAS

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1936	2	HARRISON		500	GASTROENTERITIS	.	
1940	6	CARROLL CO.		63	TYPHOID	.	
1951	2	DANVILLE		350	GASTROENTERITIS	.	
1956	.			2	HEPATITIS A VIRUS	.	
1956	10		SCHOOL	55	GASTROENTERITIS	.	
1967	7	GREENLAND	RESTAURANT	51	HEPATITIS A VIRUS	.	
1969	8	EUREKA SPRINGS	RESTAURANT	84	TOXIGENIC E. COLI	.	
1970	6		CAMP	50	SHIGELLA SONNEI	.	
1970	5	HATFIELD	RESTAURANT	79	HEPATITIS A VIRUS	.	
1971	6	WICKES	STORE	98	HEPATITIS A VIRUS	.	
1973	8	EURKA SPRINGS		42	GASTROENTERITIS	.	
1973	7	MT. IDA	CAMP	225	GASTROENTERITIS	.	
1975	8	GARLAND CO.	LODGE	23	GASTROENTERITIS	.	
1975	6	MT. IDA	CAMP	500	GASTROENTERITIS	.	
1976	7	MT IDA	CAMP	51	GASTROENTERITIS	.	
1980	7	WOLF CREEK	CAMP	40	GASTROENTERITIS	.	

CALIFORNIA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1920	5	PITTSBURG		144	TYPHOID	.	
1921	4	BRAWLEY		18	TYPHOID	.	
1921	1	COLLINSVILLE		13	TYPHOID	.	
1921	7	EL VERANO		6	TYPHOID	.	
1921	7	SONOMA CO.	RESORT	36	TYPHOID	.	
1924	1	CASCADA		9	TYPHOID	.	
1924	1	SANTA ANA		369	TYPHOID	10000	GASTROENTERITIS
1924	4	SOUTH PASADENA		16	TYPHOID	200	GASTROENTERITIS
1929	6	TULARE CO.		5	TYPHOID	.	
1930	5	ISLETON	CANNERY	6	TYPHOID	.	
1930	2	PRESTON SCHOOL		5	TYPHOID.	.	
1930	.	SACRAMENTO		63	TYPHOID	.	
1931	8	AUBURN		5	TYPHOID	.	
1931	6	BEN LOMOND		10	TYPHOID	.	
1931	5	ISLETON	CANNERY	10	TYPHOID	.	
1931	.	SACRAMENTO		26	TYPHOID	.	
1933	1	IMPERIAL	WORK CAMP	17	TYPHOID	.	
1936	3	LUCKE		29	TYPHOID	177	GASTROENTERITIS
1938	8	MOUNTAIN RESORT	CAMP	5	TYPHOID	.	
1939	10	BANGOR		2	TYPHOID	.	
1941	7	SHASTA CO.		2	SHIGELLA FLEXNERI	.	
1941	4	SHASTA CO.	SUBDIVISION	11	SHIGELLA	.	
1942	10	STOCKTON	SHIP YARD	200	GASTROENTERITIS	.	
1945	7	SANTA ROSA	LAUNDRY	3	TYPHOID	.	
1947	6	PISMO BEACH		2	TYPHOID	.	
1947	5	SANTA CLARA CO.		14	TYPHOID	.	
1947	8	SAWTELLE	HOSPITAL	300	GASTROENTERITIS	.	
1948	9	SACRAMENTO		4	TYPHOID	.	
1948	7	SAN FRANCISCO		11	SHIGELLA FLEXNERI	.	
1949	9	SUSANVILLE		5	TYPHOID	.	
1950	7	LAKE CO.	RESORT	7	TYPHOID	.	
1952	6	SAN BERNADINO CO		21	GASTROENTERITIS	.	
1953	.		INDUSTRIAL HOUSING PARK	32	HEPATITIS A VIRUS	.	
1954	12	HUMBOLDT CO		27	GASTROENTERITIS	.	
1954	1	LOS ANGELES CO.		70	GASTROENTERITIS	.	
1954	2	SODA SPRINGS		130	GASTROENTERITIS	.	
1955	9	SANTA BARBARA CO.		2	GASTROENTERITIS	.	
1955	.	YUBA CO.	PICNIC AREA	9	HEPATITIS A VIRUS	.	
1956	8	ORANGE CO.	FACTORY	28	GASTROENTERITIS	.	
1956	7	SHASTA CO.	MOTEL	43	GASTROENTERITIS	.	
1956	.	TUOLUMNE CO.	SCOUT LODGE	45	GASTROENTERITIS	.	
1958	.			2	HEPATITIS A VIRUS	.	
1958	12	VAN NUYS		1	ARSENIC	.	
1959	7	HUNTINGTON PARK	FACTORY	3	COPPER	.	
1960	.		WORK CAMP	28	GASTROENTERITIS	.	
1964	5			11	TYPHOID	.	
1964	4	NIPOMA		7	TYPHOID	.	
1965	.			8	TYPHOID	.	
1965	4	HAYWARD	SCHOOL	7	GASTROENTERITIS	.	
1965	8	MADERA		2500	GASTROENTERITIS	.	
1965	5	RIVERSIDE		16000	SALMONELLA	.	
1966	12	HUMBOLDT CO	SUBDIVISION	5	HEPATITIS A VIRUS	.	
1967	8	ARROWHEAD LODGE	LODGE	238	GASTROENTERITIS	.	
1968	10	BARTON FLATS	RECREATION AREA	1700	GASTROENTERITIS	.	

CALIFORNIA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1968	3	CRESCENT CITY	SUBDIVISION	8	HEPATITIS A VIRUS	.	
1968	.	ONTARIO CITY	SEWAGE PLANT	11	GASTROENTERITIS	.	
1970	5	IDYLLWILD		34	GIARDIA	.	
1970	2	SQUAW VALLEY	LODGE	211	GASTROENTERITIS	.	
1971	12	NORDEN	LODGE	84	GASTROENTERITIS	.	
1971	7	PICO RIVERA		3500	GASTROENTERITIS	.	
1971	2	SAN JOSE	RESTAURANT	2	COPPER	.	
1972	5	LAKE COMANCHE	RESORT	26	GASTROENTERITIS	.	
1974	9	MURPHY		18	GASTROENTERITIS	.	
1975	5	CAMP FLEMING	CAMP	80	GASTROENTERITIS	.	
1975	6	LAKESHORE	RESORT	900	GASTROENTERITIS	.	
1975	7	MYERS FLAT	CAMP	19	GASTROENTERITIS	.	
1976	5	CARMEL VALLEY	RESORT	46	GASTROENTERITIS	.	
1976	5	GROVER HOT SPRINGS	CAMP	60	GASTROENTERITIS	.	
1976	7	S. LAKE TAHOE	SEWAGE PLANT	2	GASTROENTERITIS	.	
1977	7	PAHATSI	CAMP	203	GASTROENTERITIS	.	
1977	9	PORTOLA	CAMP	12	GASTROENTERITIS	.	
1977	8	PRATTVILLE	CAMP	75	GASTROENTERITIS	.	
1977	7	SHASTA CO.	CAMP	63	GASTROENTERITIS	.	
1977	7	SHIP	SHIP	531		.	
1977	12	VENTURA	RESTAURANT	6	GASTROENTERITIS	.	
1979	9	ARCATA	CAMP	30	GASTROENTERITIS	.	
1979	2	GHARAGLE		120	GIARDIA	.	
1980	5	GRINDSTONE RANCHERIA	INDIAN RESERVATION	41	GASTROENTERITIS	.	
1980	1	SERENE LAKES	RESORT	190	VIRAL GASTROENTERITI	.	

COLORADO

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1934	7	RIFLE		28	TYPHOID		
1953	3	STERLING	SCHOOL	49	HEPATITIS A VIRUS	.	
1957	6	DENVER	PLANE	4	GASTROENTERITIS	.	
1958	11	BAKER		275	GASTROENTERITIS	.	
1958	11	PAGOSA SPRINGS		350	SHIGELLA SONNEI	.	
1962	9			4	TYPHOID	.	
1962	.	IGNACIO		4	SELENIUM	.	
1963	4	ARTESIA		14	HEPATITIS A VIRUS	.	
1965	12	ASPEN		123	GIARDIA	.	
1969	1	GARFIELD CO.	SKI AREA	36	GASTROENTERITIS	.	
1969	8	LOOKOUT MT		19	GIARDIA	.	
1972	4	BOULDER COUNTY	CAMP	142	GASTROENTERITIS	.	
1972	12	PARK CO.	SUBDIVISION	12	GIARDIA	.	
1972	4	ROCKY RIDGE	RESORT	25	GASTROENTERITIS	.	
1972	5	WILD BASIN	CAMP	28	GIARDIA	.	
1972	5	WINTER PARK	INN	24	GIARDIA	.	
1973	7	GRAND CO.	LODGE	16	GIARDIA	.	
1974	8	CREEDE	GUEST RANCH	85	GASTROENTERITIS	.	
1974	6	GRAND LAKE	LODGE	18	GIARDIA	.	
1976	6	ESTES PARK	CAMP	27	GIARDIA	.	
1976	12	GRANBY	RESORT	110	GASTROENTERITIS	.	
1976	2	GRAND CO.		12	GIARDIA	.	
1976	5	SOUTH FORK	RESTAURANT	10	GASTROENTERITIS	.	
1978	6	SOUTH FORK		350	GASTROENTERITIS	.	
1978	4	VAIL		5000	GIARDIA	.	
1979	7	ADAMS CITY	POWER PLANT	258	GASTROENTERITIS	.	
1979	6	ESTES PARK		53	GIARDIA	.	
1979	3	GRANBY		200	GASTROENTERITIS	.	
1980	3	BRECKENRIDGE		22	GASTROENTERITIS	.	
1980	7	DURANGO	CAMP	38	GASTROENTERITIS	.	
1980	6	GREELEY		18	GASTROENTERITIS	.	
1980	8	LAS ANIMAS		34	GASTROENTERITIS	.	
1980	7	PINE	STORE	5	GASTROENTERITIS	.	

CONNECTICUT

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1938	9	GLASTONBURY		123	GASTROENTERITIS	.	
1940	5	ELLINGTON		4	TYPHOID	.	
1949	9	MIDDLETOWN	INN	50	GASTROENTERITIS	.	
1950	7		BOARDING HOUSE	15	GASTROENTERITIS	.	
1957	4	FAIRFIELD	COUNTRY CLUB	17	GASTROENTERITIS	.	
1960	7	BROOKFIELD	SCHOOL	22	HEPATITIS A VIRUS	.	
1973	8	FARMINGTON		74	GASTROENTERITIS	.	
1976	6	SHELTON	COUNTRY CLUB	300	GASTROENTERITIS	.	
1977	10	NEW HAVEN		3	COPPER	.	
1978	11	NEW BRITAIN	SCHOOL	12	COPPER	.	
1980	9	NEW HAVEN	SCHOOL	800	CAMPYLOBACTER	.	

DELAWARE

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1930	8	MILFORD		46	TYPHOID		

DISTRICT OF COLUMBIA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1945	8	WASHINGTON		8	TYPHOID	.	
1955	1			7	GASTROENTERITIS	.	

FLORIDA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY; DISEASE
1964	3	GAINESVILLE		16000	GASTROENTERITIS	.	
1972	11	MASCOTTE		41	OIL	.	
1972	5	NOKOMIS	PARK	40	GASTROENTERITIS	.	
1973	2	HOMESTEAD	CAMP	210	TYPHOID	.	
1973	10	TAMPA	INDUSTRIAL PARK	194	GASTROENTERITIS	.	
1974	1	RICHMOND HTS		1200	SHIGELLA SONNEI	.	
1976	11	DILLMAN HTS		31	GASTROENTERITIS	.	

GEORGIA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1924	4	BAXLEY		35	TYPHOID	40	GASTROENTERITIS
1940	8	WRENS		35	TYPHOID	.	
1942	1	DOUGHERTY CO.	FACTORY	81	TYPHOID	19	GASTROENTERITIS
1953	6	PRESLEY	CAMP	44	SHIGELLA FLEXNERI	.	
1963	6			60	GASTROENTERITIS	.	
1968	7	WACO	CAMP	44	SHIGELLA SONNEI	.	
1980	8	LINDALE		1500	VIRAL GASTROENTERITI	.	
1980	12	MILSTEAD		56	NAOH	.	

HAWAII

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1970	8	WAIHEE		42	SHIGELLA SONNEI	.	
1972	9	MOLOKAI	CAMP	61	SHIGELLA SONNEI	.	
1978	7	HONOLULU	CAMP	11	SALMONELLA	.	

IDAHO

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1920	9	BOISE		40	TYPHOID	.	
1927	10	BONNERS FERRY		7	TYPHOID	.	
1928	12	IDAHO FALLS		15	TYPHOID	.	
1936	5	MCCALL		9	TYPHOID	.	
1946	6	IDAHO FALLS	RESORT	250	GASTROENTERITIS	.	
1956	7	FREMONT	CAMP	15	GASTROENTERITIS	.	
1958	8	KAMIAH		10	HEPATITIS A VIRUS	.	
1958	4	WILDER		400	SHIGELLA FLEXNERI	.	
1968	1			4	PESTICIDE	.	
1970	6	ROCKALND		35	SALMONELLA	.	
1974	3	BLISS	RESTAURANT	9	GASTROENTERITIS	.	
1975	9			9	GIARDIA	.	
1976	6	WHITEBIRD	CAMP	100	GASTROENTERITIS	.	
1978	11		RESTAURANT	27	GASTROENTERITIS	.	

ILLINOIS

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1920	1	BLOOMINGTON	RAILROAD SHOP	200	TYPHOID	1000	GASTROENTERITIS
1920	10	MAYWOOD	PLANT	75	GASTROENTERITIS	.	
1923	11	CHICAGO		228	TYPHOID	500	GASTROENTERITIS
1925	11	CHARLESTON		2000	GASTROENTERITIS	.	
1925	1	GREENVILLE		2000	GASTROENTERITIS	.	
1925	8	LOCKPORT		18	TYPHOID	.	
1925	2	STERLING		12	TYPHOID	.	
1926	10	WATSEKA		34	TYPHOID	.	
1927	7	ASSUMPTION		78	GASTROENTERITIS	.	
1927	8	JONESBORO		23	TYPHOID	.	
1928	1	MARSEILLES		700	GASTROENTERITIS	.	
1928	10	YORKVILLE		400	GASTROENTERITIS	.	
1929	9	RIVERSIDE		1000	GASTROENTERITIS	.	
1933	6	CHICAGO	PLANT	1	TYPHOID	30	GASTROENTERITIS
1933	6	CHICAGO	HOTEL	1409	E. HISTOLYTICA	.	
1933	12	CHICAGO	FACTORY	3	TYPHOID	75	GASTROENTERITIS
1933	4	DELAND SCHOOL	SCHOOL	50	TYPHOID	.	
1933	10	GREENUP		5	TYPHOID	.	
1933	7	MARSEILLES	CAMP	200	GASTROENTERITIS	.	
1934	5	CHICAGO	STOCKYARD	69	TYPHOID	311	
1935	10	CHICAGO	FACTORY	83	GASTROENTERITIS	3	E. HISTOLYTICA
1936	5	OHIO		150	GASTROENTERITIS	.	
1941	7	ALTON	PARK	3	TYPHOID	.	
1941	10	BELLEVILLE	SCHOOL	21	GASTROENTERITIS	.	
1941	4	CARROLTON		100	GASTROENTERITIS	.	
1942	9	JOLIET TWP		70	TYPHOID	.	
1942	7	LEE CO.	FACTORY	297	GASTROENTERITIS	.	
1945	10	CHICAGO	SCHOOL	195	GASTROENTERITIS	.	
1948	4	JOLIET	FACTORY	9	GASTROENTERITIS	.	
1949	1	LINCOLN	INN	13	GASTROENTERITIS	.	
1949	2	LINCOLN	INN	22	GASTROENTERITIS	.	
1949	3	LINCOLN	INN	5	GASTROENTERITIS	.	
1952	9	CHICAGO	HOSPITAL	45	GASTROENTERITIS	.	
1952	6	HENRY CO.	COUNTRY CLUB	50	GASTROENTERITIS	.	
1953	4	ELGIN	RESTAURANT	70	GASTROENTERITIS	.	
1953	4	ELGIN	RESTAURANT	25	GASTROENTERITIS	.	
1955	4	MAPLE PARK	SCHOOL	22	GASTROENTERITIS	.	
1957	5	RIO	CHURCH	100	GASTROENTERITIS	.	
1959	5	LAKE CO.	CAMP	11	GASTROENTERITIS	.	
1960	.			2	TYPHOID	.	
1962	3	BATAVIA	COUNTRY CLUB	27	GASTROENTERITIS	.	
1962	9	JOLIET		4	SHIGELLA FLEXNERI	.	
1962	.	MATTON		95	HEPATITIS A VIRUS	.	
1963	10	BATAVIA	COUNTRY CLUB	30	GASTROENTERITIS	.	
1972	5	GRAFTON	PARK	90	GASTROENTERITIS	.	
1974	9			1	HERBICIDE	.	
1977	5	ARTHUR	RESTAURANT	154	GASTROENTERITIS	.	
1980	4		RESTAURANT	30	GASTROENTERITIS	.	

INDIANA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1920	11	ANDERSON		18	TYPHOID	.	
1923	11	FORT WAYNE		140	TYPHOID	.	
1923	7	LIBERTY		12	TYPHOID	.	
1924	3	HAMMOND		21	TYPHOID	.	
1924	12	WASHINGTON		12	TYPHOID	.	
1925	11	GARRETT		600	GASTROENTERITIS	.	
1925	7	WINONA LAKE	CAMP	1000	TYPHOID	.	
1927	9	NORTH JUDSON		200	GASTROENTERITIS	.	
1927	3	SHIRLEY		250	GASTROENTERITIS	.	
1929	3	FORT WAYNE		53	TYPHOID	5000	GASTROENTERITIS
1931	8	CLOVERDALE		15	TYPHOID	.	
1931	12	EDGEWOOD SCHOOL	SCHOOL	390	GASTROENTERITIS	.	
1931	9	SEYMOUR		35	TYPHOID	.	
1931	1	TIPTON SCHOOL	SCHOOL	30	GASTROENTERITIS	.	
1932	7	FRANKLIN CO.		19	TYPHOID	.	
1932	8	SEYMOUR		28	TYPHOID	.	
1933	9	BRAZIL		10	TYPHOID	.	
1933	7	GREENCASTLE		7	TYPHOID	.	
1933	7	HARTFORD CITY		20	TYPHOID	.	
1933	7	NEW BETHEL		6	TYPHOID	.	
1934	7	CIRCUS CAMP	CAMP	5	TYPHOID	.	
1934	4	FORT WAYNE		23	TYPHOID	.	
1934	6	MADOC		5	TYPHOID	.	
1934	8	OAKLAND CITY	CAMP	5	TYPHOID	.	
1935	3	GREENCASTLE		9	TYPHOID	.	
1935	7	INDIANAPOLIS	CONVENT	30	TYPHOID	.	
1936	8	OAKTOWN		5	TYPHOID	.	
1938	4	ANGOLA	HOTEL	57	TYPHOID	.	
1938	2	BEN DAVIS		52	GASTROENTERITIS	.	
1938	7	BOYS CLUB		75	GASTROENTERITIS	.	
1938	1	LAFAYETTE	SCHOOL	250	GASTROENTERITIS	.	
1938	8	MITCHELL		17	TYPHOID	.	
1939	7	BATTLE GROUND		34	GASTROENTERITIS	.	
1939	5	NEW BETHEL		3	TYPHOID	.	
1939	7	PUTNAM CO.		3	TYPHOID	.	
1940	6	ANDERSON	SEWAGE PLANT	13	SHIGELLA	.	
1940	1	MITCHELL		310	SHIGELLA FLEXNERI	.	
1940	1	SEYMOUR		2250	SHIGELLA FLEXNERI	.	
1941	10	INDIANAPOLIS	SANITARIUM	18	GASTROENTERITIS	.	
1942	7	CAMP ATTERBURY		18	GASTROENTERITIS	.	
1942	5	CAMPBELLSBURG		4	TYPHOID	.	
1942	4	MARION CO.		2	GASTROENTERITIS	.	
1942	6	PERU		56	GASTROENTERITIS	.	
1943	5	BERNE		300	GASTROENTERITIS	.	
1943	9	HOWARD CO.	SCHOOL	90	GASTROENTERITIS	.	
1943	9	MARION CO.	SCHOOL	65	GASTROENTERITIS	.	
1944	6	MARION CO.		5	TYPHOID	.	
1945	2	LOOGOOTEE		5	TYPHOID	.	
1945	6	MARION CO.		7	TYPHOID	.	
1946	1		FACTORY	30	GASTROENTERITIS	.	
1949	10	ORLEANS		5	TYPHOID	.	
1953	7	SOUTH BEND	FACTORY	31	E. HISTOLYTICA	.	
1967	6	INDIANAPOLIS		2	GASTROENTERITIS	.	
1972	4	WASHINGTON CO.	PARK	2	SHIGELLA SONNEI	.	

INDIANA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1975	1	SELLERSBURG		1400	GASTROENTERITIS	.	
1980	8	FRIENDSHIP	CAMP	4	SHIGELLA SONNEI	.	

IOWA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1920	7	PELLA		33	TYPHOID	.	
1921	6	DUNREATH		8	TYPHOID	.	
1926	8	FAIRFIELD		27	TYPHOID	.	
1927	8	PERRY		26	TYPHOID	.	
1928	10	OAKDALE	INSTITUTION	35	GASTROENTERITIS	.	
1929	.	IOWA CITY		1	TYPHOID	5	GASTROENTERITIS
1929	7	OSAGE		8	TYPHOID	.	
1929	3	PELLA		11	TYPHOID	.	
1929	1	WATERLOO	FACTORY	5	TYPHOID	.	
1935	11	FARM		38	TYPHOID	.	
1965	1		RESTAURANT	67	SHIGELLA SONNEI	.	
1972	11	STOCKPORT	SCHOOL	208	SHIGELLA SONNEI	.	
1977	7	KEOTA		206	SALMONELLA	.	
1979	4	CRESCENT	CAMP	100	GASTROENTERITIS	.	

KANSAS

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1923	7	HERINGTON	PARK	79	TYPHOID	.	
1930	9	FT. SCOTT	PICNIC	7	TYPHOID	.	
1933	8	HERINGTON	PARK	5	TYPHOID	.	
1935	7	CHASE CO.		6	TYPHOID	.	
1935	1	SMOLAN	SCHOOL	28	HEPATITIS A VIRUS	.	
1941	7	ATCHINSON CO.	RECREATION AREA	4	TYPHOID	.	
1942	9	NEWTON		2690	SHIGELLA	.	
1970	7	RILEY	SERVICE STATION	12	HEPATITIS A VIRUS	.	

KENTUCKY

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1922	8	CENTRAL CITY		36	TYPHOID	100	GASTROENTERITIS
1922	11	HARLAN		40	TYPHOID	.	
1923	2	COVINGTON/NEWPORT		100	TYPHOID	300	GASTROENTERITIS
1924	3	ADAIRVILLE		15	TYPHOID	.	
1924	8	PRESTONSBURG		40	TYPHOID	.	
1925	3	FRANKFORT		40	TYPHOID	.	
1928	3	MIDWAY SCHOOL	SCHOOL	15	TYPHOID	.	
1929	7	ELKTON		15	TYPHOID	.	
1935	6	BURKSVILLE	HOTEL	26	GASTROENTERITIS	.	
1935	6	TAYLORSVILLE		186	TYPHOID	.	
1936	10	ST. MARY	SCHOOL	16	TYPHOID	50	GASTROENTERITIS
1939	6	HOPKINSVILLE		14	TYPHOID	.	
1940	11	GEORGETOWN		2100	GASTROENTERITIS	.	
1940	1	HENDERSON		2250	GASTROENTERITIS	.	
1940	11	JEFFERSON CO.	COMPANY	104	GASTROENTERITIS	.	
1940	9	LOUISVILLE		12	GASTROENTERITIS	.	
1940	9	MT. STERLING		20	TYPHOID	.	
1942	9	GLENDALE	SCHOOL	138	GASTROENTERITIS	.	
1942	9	JEFFERSON CO.	SUBDIVISION	115	GASTROENTERITIS	.	
1943	6	ELIZABETHTOWN		200	GASTROENTERITIS	.	
1943	11	HARRODSBURG		1166	GASTROENTERITIS	106	TYPHOID
1944	3	ELIZABETHTOWN		4	GASTROENTERITIS	.	
1953	12	FT. CAMPBELL		13	TYPHOID	.	
1954	.		SCHOOL	13	GASTROENTERITIS	.	
1956	6	UTICA		9	HEPATITIS A VIRUS	.	
1963	7	FLEMING CO.	CAMP	7	TYPHOID	.	
1964	5	BOONE CO.	SCHOOL	115	GASTROENTERITIS	.	
1967	8	LOGAN CO.	RESTAURANT	73	HEPATITIS A VIRUS	.	
1971	7	GREENBO LAKE PARK	PARK	68	GASTROENTERITIS	.	

LOUISANA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1941	6	BATCHELOR		3	TYPHOID	.	
1941	10	CROWLEY	WORK CAMP	75	GASTROENTERITIS	.	
1941	5	RHYMES PLANTATION		11	TYPHOID	.	
1941	8	SIMMSPORT		10	TYPHOID	.	
1942	10	NEW ORLEANS	CONSTRUCTION CREW	200	GASTROENTERITIS	.	
1947	9	PERRY	SHIP	11	TYPHOID	.	
1948	8	WALLACE		13	TYPHOID	.	
1955	10	CHALMATTE	FACTORY	8	GASTROENTERITIS	.	
1956	8	SHREVEPORT		72	GASTROENTERITIS	.	
1961	9	JENNINGS		2	TYPHOID	.	
1968	5	ST. BERNARD PARISH	CAMP	9	GASTROENTERITIS	.	
1975	5	OFFSHORE OIL RIG		26	OIL	.	

MAINE

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1922	7	BAILEYVILLE P.O.		51	TYPHOID	.	
1927	11	VANBUREN		11	TYPHOID	.	
1930	9	BELFAST		6	TYPHOID	.	
1930	9	BUCKSPORT	RESTAURANT	7	TYPHOID	.	
1930	4	MADAWASKA		9	TYPHOID	.	
1931	1	BUCKSPORT		6	TYPHOID	.	
1938	1	ASHLAND	WORK CAMP	2	TYPHOID	.	
1948	3	WESTFIELD		5	PARATYPHOID	.	
1961	10		SCHOOL	89	GASTROENTERITIS	.	
1961	1		TRAILER PARK	6	SHIGELLA FLEXNERI	.	
1977	7	ELLSWORTH	CAMP	91	GASTROENTERITIS	.	
1978	8	POLAND	CAMP	70	GASTROENTERITIS	.	
1979	5	ISLAND FALLS		6		.	
1979	6	WOOLWICH		70	GASTROENTERITIS	.	

MARYLAND

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1920	.	BROOKLYN		5	GASTROENTERITIS	.	
1920	9	WESTERNPORT		32	GASTROENTERITIS	.	
1921	8	LINDERVILLE		8	TYPHOID	.	
1921	12	WESTERNPORT		24	TYPHOID	.	
1922	9	KITZMILLER		10	TYPHOID	.	
1922	3	MCCOOL		6	TYPHOID	.	
1923	7	NORTHEAST		26	TYPHOID	.	
1923	.	VALE		9	TYPHOID	.	
1924	6	POINT OF ROCKS		13	TYPHOID	.	
1924	6	SAVAGE		7	TYPHOID	.	
1925	9	HAVRE DE GRACE		17	TYPHOID	.	
1925	10	WESTERNPORT		10	TYPHOID	.	
1926	9	ADAMSTOWN	CANNING FACTORY	22	TYPHOID	.	
1926	7	DUNDALK JUNCTION		22	TYPHOID	.	
1926	8	LONACONING		34	GASTROENTERITIS	.	
1927	1	ANNAPOLIS		20	TYPHOID	.	
1927	11	DRAYDEN		13	TYPHOID	.	
1927	.	HAYDEN		7	TYPHOID	.	
1927	7	TOWSON	JAIL	9	TYPHOID	.	
1928	7	EASTPORT		37	TYPHOID	.	
1928	8	WILLIAMSPORT		14	TYPHOID	.	
1931	7	MAUGANSVILLE		27	TYPHOID	.	
1932	5	CLEARSPRING		17	TYPHOID	.	
1932	7	FAIRVIEW BEACH	RESORT	200	GASTROENTERITIS	.	
1932	7	VINDEX		41	TYPHOID	.	
1935	6	SPARROWS POINT		245	GASTROENTERITIS	.	
1938	10	BEL AIR		663	GASTROENTERITIS	.	
1939	10	NARROWS PARK		6	TYPHOID	.	
1941	8	GREENSBORO	FACTORY	4	TYPHOID	.	
1941	5	MIDLAND		204	GASTROENTERITIS	.	
1941	6	MT. SAVAGE		32	TYPHOID	.	
1942	3	BALTIMORE	STORE	224	GASTROENTERITIS	.	
1942	6	STILL POND		4	TYPHOID	.	
1943	1	ELKTON		1000	GASTROENTERITIS	.	
1944	4	ASHTON		4	TYPHOID	.	
1944	3	BALTIMORE	SHIP	13	GASTROENTERITIS	.	
1946	4	ST. JAMES	SCHOOL	35	GASTROENTERITIS	.	
1948	10	MALCOLM		2	TYPHOID	.	
1949	8	POMFRET		2	TYPHOID	.	
1966	4	SHARPSBURG		37	HEPATITIS A VIRUS	.	
1969	5	FREDERICK CO.		54	SHIGELLA SONNEI	.	
1970	11			4	TYPHOID	.	
1972	6	CECIL CO.	CAMP	88	GASTROENTERITIS	.	
1973	4	FREDERICK CO.	FARM	2	TYPHOID	.	
1973	12	HAGERSTOWN	REST HOME	94	SHIGELLA	.	
1978	7	WASHINGTON CO.	TRAILER PARK	22	SHIGELLA FLEXNERI	.	
1979	11	ANNAPOLIS		26		.	
1980	7	FREDERICK CO.	CAMP	127	VIRAL GASTROENTERITI	.	

MASSACHUSETTS

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1930	9	LAWRENCE	PICNIC	7	TYPHOID	.	
1930	12	LAWRENCE	FACTORY	10	TYPHOID	.	
1931	3	COHASSET		500	GASTROENTERITIS	.	
1932	3	DEERFIELD		40	GASTROENTERITIS	.	
1932	10	FISKDALE	MILL	100	GASTROENTERITIS	.	
1932	10	WILLIAMSBURG		200	GASTROENTERITIS	.	
1934	3	COHASSET		200	GASTROENTERITIS	.	
1934	3	FITCHBURG		2500	GASTROENTERITIS	.	
1934	12	MONROE		33	GASTROENTERITIS	.	
1934	10	PITTSFIELD		30	GASTROENTERITIS	.	
1935	6	NORTH ADAMS		50	GASTROENTERITIS	.	
1935	2	NORTHFIELD		125	GASTROENTERITIS	.	
1935	5	WORCESTER		10	TYPHOID	.	
1938	11	MIDDLEBORO	FACTORY	68	GASTROENTERITIS	.	
1938	4	SOUTH DEERFIELD		2	GASTROENTERITIS	.	
1939	4	BOSTON		15	GASTROENTERITIS	.	
1939	9	FRAMINGHAM	PICNIC	75	GASTROENTERITIS	.	
1939	1	PALMER		50	GASTROENTERITIS	.	
1940	7	QUINCY		5	TYPHOID	.	
1940	4	SOUTH HADLEY	SCHOOL	90	GASTROENTERITIS	.	
1941	1	BOSTON		3	TYPHOID	.	
1941	6	FALL RIVER	FACTORY	2	GASTROENTERITIS	.	
1941	7	SALISBURG	SUMMER HOMES	40	GASTROENTERITIS	.	
1947	9	CANTON		1064	GASTROENTERITIS	.	
1948	3	HINGHAM		9	GASTROENTERITIS	.	
1953	8	NEWBERRYPORT		4	GASTROENTERITIS	.	
1969	6	GRAFTON		110	GASTROENTERITIS	7	HEPATITIS A VIRUS
1969	9	WORCHESTER		90	HEPATITIS A VIRUS	.	
1972	6	MEDFORD		3	GASTROENTERITIS	.	
1975	2	BOSTON		17	HEPATITIS A VIRUS	.	
1976	7		CAMP GROUNDS	18	GASTROENTERITIS	.	
1979	3	TEMPLETON		500	GASTROENTERITIS	.	

MICHIGAN

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1920	3	ALPENA		118	TYPHOID	.	
1921	8	IONIA		19	TYPHOID	.	
1922	4	ONTONAGON		69	TYPHOID	.	
1925	10	ECO CITY		14	TYPHOID	.	
1926	2	DETROIT		8	TYPHOID	45000	GASTROENTERITIS
1926	8	RUDGERS CITY		20	TYPHOID	.	
1931	12	MONROE TWP		9	TYPHOID	.	
1932	4	LAPEER		7	TYPHOID	.	
1934	7	DETROIT	CIRCUS CAMP	60	TYPHOID	.	
1934	5	GLADSTONE		900	GASTROENTERITIS	.	
1935	7	BESSEMER		23	TYPHOID	.	
1935	5	MORENCI		472	GASTROENTERITIS	.	
1941	6	PAW PAW	FARM COMPANY	20	SHIGELLA FLEXNERI	.	
1942	12	ST. JOHNS		708	GASTROENTERITIS	.	
1947	8	SAGINAW		14	TYPHOID	.	
1951	7	CENTERLINE		3500	GASTROENTERITIS	.	
1959	1	POSEN		16	HEPATITIS A VIRUS	.	
1967	8	ST. PAUL	PARK	2	TYPHOID	.	
1970	1	MONROE CO.	RESTAURANT	2	GASTROENTERITIS	.	
1977	11	HARBOR SPRINGS		4		.	
1979	9	SELFRIDGE		12	GASTROENTERITIS	.	
1980	9	FLINT	SCHOOL	60	GASTROENTERITIS	.	
1980	7	ISLE ROYALE	PARK	6	GASTROENTERITIS	.	

MINNESOTA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1921	10	PUPOSKY	INSTITUTION	10	TYPHOID	.	
1922	1	BAUDETTE		13	TYPHOID	.	
1927	7	OWATONNA		13	TYPHOID	.	
1928	8	HASTINGS		89	GASTROENTERITIS	.	
1929	6	ST. PAUL	PACKING PLANT	300	GASTROENTERITIS	.	
1930	8	MINNEAPOLIS	SHIP	1	TYPHOID	13	GASTROENTERITIS
1933	8	GRAND MARAIS	RESORT	52	GASTROENTERITIS	.	
1934	8	GRAND MARAIS	RESORT	60	GASTROENTERITIS	.	
1935	12	ELY	CAMP	28	TYPHOID	150	GASTROENTERITIS
1935	5	MINNEAPOLIS		213	TYPHOID	.	
1935	10	MINNEAPOLIS	MILL	2	TYPHOID	42	GASTROENTERITIS
1939	8	MINNEAPOLIS	OFFICE	400	GASTROENTERITIS	2	TYPHOID
1940	7	HARMONY VILLAGE		11	TYPHOID	.	
1941	5	SPRING PARK VIEW	TAVERN	6	TYPHOID	.	
1941	6	ST PAUL	FACTORY	21	GASTROENTERITIS	.	
1942	3	SPRING VALLEY		200	GASTROENTERITIS	.	
1943	6		SCHOOL	47	GASTROENTERITIS	.	
1943	3	RACINE VILLAGE		75	GASTROENTERITIS	.	
1944	11	RAMSEY CO.	FACTORY	120	GASTROENTERITIS	.	
1972	5	PERHAM	OFFICE	11	ARSENIC	.	
1975	6	GRAND MARAIS	CAMP	136	GASTROENTERITIS	.	
1977	6	SILVER CREEK TWP.	RESORT	13	GASTROENTERITIS	.	
1978	10	CHASKA	TRAILER PARK	137	GASTROENTERITIS	.	
1979	6	ALEXANDRIA	RESORT	61	SALMONELLA	.	
1979	11	OAK		1		.	
1979	7	ST. LOUIS	RESORT	9	GASTROENTERITIS	.	
1980	6	EAST CHAIN	CHURCH	30	GASTROENTERITIS	.	

MISSISSIPPI

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY/DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1922	1	CANTON		42	TYPHOID	500	GASTROENTERITIS
1923	7	CARROLL CO		40	TYPHOID	.	
1935	9	MAGNOLIA ..	FACTORY	15	TYPHOID	.	
1959	.	JONES CO,		5	E, HISTOLYTICA	.	
1971	7	BAY ST, LOUIS	CAMP	187	SHIGELLA SONNEI	.	
1976	10			20	PCB	.	

MISSOURI

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1921	9	MILLER	SCHOOL	20	TYPHOID	.	
1924	9	ANDERSON	PICNIC	8	TYPHOID	.	
1925	5	JACKSON		114	GASTROENTERITIS	.	
1925	11	PIERCE CITY		21	TYPHOID	.	
1928	6	OZARK BEACH	RESORT	2000	GASTROENTERITIS	.	
1929	5	WINSTON	SCHOOL	82	TYPHOID	.	
1936	6	SPRINGFIELD		225	TYPHOID	.	
1939	9	JACKSON CO.		10	TYPHOID	.	
1940	5	SPRINGFIELD	SUBDIVISION	27	TYPHOID	.	
1942	9	JEFFERSON CITY		10	TYPHOID	.	
1943	2	LINNEUS	SCHOOL	40	GASTROENTERITIS	.	
1956	7	MONARCH SPRINGS	CAMP	34	TYPHOID	.	
1958	7	PIEDMONT		61	GASTROENTERITIS	.	
1959	10	PLATTE CO.		17	TYPHOID	.	
1968	8	MEXICO	CAMP	35	TYPHOID	.	
1970	7	BIGELOW		9	HEPATITIS A VIRUS	.	
1971	.	PACIFIC	SUBDIVISION	2	GASTROENTERITIS	.	
1978	5	WEST PLAINS	RESTAURANT	750	GASTROENTERITIS	.	

MONTANA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY, DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1929	9	HELENA		205	TYPHOID	.	
1949	6	GALLATIN	RANCH	4		.	
1960	9	CROW AGENCY		2	TYPHOID	.	
1962	12	CROW AGENCY		50	HEPATITIS A VIRUS	.	
1974	12	BIG SKY	RESORT	615	GASTROENTERITIS	.	
1975	8		CAMP	56	SHIGELLA SONNEI	.	
1977	7	GLACIER PARK	HOTEL	55	GIARDIA	.	
1977	7	WHITE SULFUR SPRINGS		200	GIARDIA	.	
1980	6	RED LODGE		780	GIARDIA	.	

NEBRASKA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1921	7	U.P.		15	TYPHOID	.	
1947	1	MILFORD	SCHOOL	150	GASTROENTERITIS	.	
1952	6	LINCOLN		16		.	
1978	6	ASHLAND	WORK CREW	23	GASTROENTERITIS	.	

NEVADA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY, DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY, DISEASE
1941	2	DAYTON		6	TYPHOID	.	
1964	11	MARIANO LAKE		5	PARATYPHOID	.	
1967	.	FALLON		2	ARSENIC	.	

NEW HAMPSHIRE

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1959	11	KEENE		14	TYPHOID	.	
1963	12	COOS CO.	PARK	70	GASTROENTERITIS	.	
1974	8	FRANCONIA NOTCH		7	GASTROENTERITIS	.	
1974	6	MERIDEN		78	GIARDIA	.	
1977	4	BERLIN		750	GIARDIA	.	
1979	8	ANDOVER	CAMP	38	GASTROENTERITIS	.	
1979	4	CHARLESTOWN		50	GIARDIA	.	

NEW JERSEY

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1921	5	HAMILTON TWP.	FACTORY	7	TYPHOID	.	
1922	9	BURLINGTON		10	TYPHOID	.	
1922	11	FRANKLIN		114	TYPHOID	.	
1923	5	ROCKAWAY		44	TYPHOID	.	
1924	6	ENGLEWOOD	HIKERS	10	TYPHOID	.	
1925	6	BERGEN CO.	PARK	29	TYPHOID	.	
1926	1	WOODBURY		11	TYPHOID	.	
1936	8	ENGLEWOOD	PARK	44	TYPHOID	.	
1939	12	NEWARK		325	GASTROENTERITIS	.	
1940	10	BURLINGTON	HIKERS	5	TYPHOID	.	
1940	6	HOPEWELL TWSP.		17	TYPHOID	.	
1942	10	CAMDEN	SHIP YARD	447	GASTROENTERITIS	.	
1960	8	LEBANON	CAMP	63	SHIGELLA SONNEI	.	
1962	9	CAMDEN	SHIPYARD	680	GASTROENTERITIS	.	
1967	9			15	HEPATITIS A VIRUS	.	
1968	5	UNION CO.		200	GASTROENTERITIS	.	
1971	8	WARREN CO.	CAMP	67	SHIGELLA SONNEI	.	
1973	3		OFFICE	2	GASTROENTERITIS	.	
1973	6		CAMP	22	GASTROENTERITIS	.	
1973	8	DELAWARE	CAMP	46	GASTROENTERITIS	.	
1974	1			57	GASTROENTERITIS	.	
1975	6			4	HERBICIDE	.	
1975	4	DUNELLEN	SCHOOL	350	GASTROENTERITIS	.	
1975	1	PASSAIC CO.	RESTAURANT	390	GASTROENTERITIS	.	
1976	10	WARREN	RESTAURANT	104	GASTROENTERITIS	.	
1977	4	MONTGOMERY TWP	CAMP	10	GASTROENTERITIS	.	

NEW MEXICO

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1920	1	SAN JUAN CO.		152	TYPHOID	.	
1927	9	LAS VEGAS		54	TYPHOID	.	
1928	9	HAGERMAN		14	TYPHOID	.	
1939	7	MARTINEZ		2	TYPHOID	.	
1941	4	EL MORRO COURT	RESTAURANT	128	GASTROENTERITIS	.	
1941	7	LOBO CANYON	RECREATION AREA	43	GASTROENTERITIS	.	
1941	8	OHOGRANDE		8	SHIGELLA	.	
1943	9	GALLINAS		3	TYPHOID	.	
1945	1	ANTON CHICO		9	TYPHOID	.	
1946	2	GRANTS		200	GASTROENTERITIS	.	
1949	9	LAS CRUCES		25	HEPATITIS A VIRUS	.	
1957	9	SHIPROCK		4	TYPHOID	.	
1958	7	SANDOVAL CO.		23	SHIGELLA SONNEI	.	
1969	11			4	TYPHOID	.	
1971	8	ROSWELL	GOLF COURSE	10	GASTROENTERITIS	.	
1978	11	LUNAS	SCHOOL	34		.	
1979	8	LOS ALAMOS	SCHOOL	2	MORPHOLINE	.	
1980	7	CHAMA		24	GASTROENTERITIS	.	
1980	6	MT. VIEW		1		.	

NEW YORK

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY, DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1920	10	AMSTERDAM	MILL	22	TYPHOID	.	
1920	1	MECHANICVILLE		96	TYPHOID	.	
1920	3	MOUNT VERNON		9	TYPHOID	.	
1920	3	SCHENECTADY		53	TYPHOID	.	
1920	3	SENECA FALLS		100	TYPHOID	.	
1920	10	WHITESBORO	INDUSTRY	5	TYPHOID	.	
1921	9	GOUVERNEUR		85	TYPHOID	.	
1923	3	JOHNSON CITY		19	TYPHOID	.	
1924	4	ALBANY		114	TYPHOID	.	
1925	7	PALISADES PARK	PARK	51	TYPHOID	.	
1925	12	YONKERS		25	TYPHOID	.	
1926	9	ADDISON		58	TYPHOID	.	
1926	8	AKRON		284	TYPHOID	109	GASTROENTERITIS
1926	12	ROCHESTER		40	TYPHOID	.	
1927	10	ALBANY	PLANT	30	TYPHOID	80	GASTROENTERITIS
1927	9	COHOES	PLANT	48	TYPHOID	.	
1927	9	HORNELL		10	TYPHOID	.	
1927	8	OSWEGO	MILL	10	TYPHOID	.	
1927	12	OSWEGO		500	GASTROENTERITIS	.	
1928	9	OLEAN		245	TYPHOID	.	
1936	7	BETHEL	HOTEL	20	GASTROENTERITIS	.	
1936	7	HIGHLAND	LODGE	8	GASTROENTERITIS	.	
1936	7	INDIAN LAKE	HOTEL	12	TYPHOID	29	GASTROENTERITIS
1936	7	LIBERTY	HOTEL	20	GASTROENTERITIS	.	
1936	3	MONTGOMERY		50	GASTROENTERITIS	.	
1936	9	OLD FORGE		28	GASTROENTERITIS	.	
1936	8	ROCKLAND	HOTEL	300	GASTROENTERITIS	.	
1936	8	SCHROON	HOTEL	200	GASTROENTERITIS	.	
1936	3	SIDNEY CENTER		46	GASTROENTERITIS	.	
1936	7	WARWASSING	HOTEL	20	GASTROENTERITIS	.	
1938	7	BETHEL	SUMMER HOUSE	6	TYPHOID	.	
1938	7	CEDAR HILL		11	GASTROENTERITIS	.	
1938	7	CENTRAL BRIDGE	WORK CAMP	5	GASTROENTERITIS	.	
1938	6	CHEEKTOWAGA		90	GASTROENTERITIS	.	
1938	8	DEER PARK	CAMP	241	SHIGELLA FLEXNERI	.	
1938	8	DEER PARK	CAMP	35	GASTROENTERITIS	.	
1938	2	GREENPORT	HOTEL	14	GASTROENTERITIS	.	
1938	7	HOMER	CAMP	32	GASTROENTERITIS	.	
1938	8	HYDE PARK	HOTEL	2	GASTROENTERITIS	.	
1938	7	INLET	HOTEL	15	GASTROENTERITIS	.	
1938	6	KINDERHOOK	CONSTRUCTION CREW	6	TYPHOID	.	
1938	6	LAKE PLACID	CAMP	9	GASTROENTERITIS	.	
1938	7	LIVONIA	CAMP	33	GASTROENTERITIS	.	
1938	8	MAMAKATING	HOTEL	33	GASTROENTERITIS	.	
1938	4	NEWBURGH	SCHOOL	18	GASTROENTERITIS	.	
1938	8	OSWEGO	TRAILER	18	TYPHOID	.	
1938	8	PATTERSON	CAMP	56	SHIGELLA SONNEI	.	
1938	2	PEMBROOK	SCHOOL	94	GASTROENTERITIS	.	
1938	7	PLATTEKILL	CAMP	50	GASTROENTERITIS	.	
1938	7	PUTNAM	CAMP	7	TYPHOID	.	
1938	5	RAVENA		84	SHIGELLA SONNEI	.	
1938	8	SANTA CLARA	CAMP	13	GASTROENTERITIS	.	
1938	7	THOMPSON		13	SHIGELLA SONNEI	.	
1938	7	THOMPSON	HOTEL	11	GASTROENTERITIS	.	

NEW YORK

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY, DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1939	7	ALEXANDRIA	HOTEL	9	GASTROENTERITIS	.	
1939	7	ANNSVILLE	INSTITUTION	8	GASTROENTERITIS	.	
1939	7	BETHEL	BOARDING HOUSE	62	GASTROENTERITIS	.	
1939	8	CALICOON	HOTEL	270	GASTROENTERITIS	.	
1939	10	CANEADIA	SCHOOL	61	GASTROENTERITIS	.	
1939	9	CONEWANGO	SCHOOL	18	GASTROENTERITIS	.	
1939	7	DEER PARK	CAMP	82	GASTROENTERITIS	.	
1939	7	FALLSBURG	BOARDING HOUSE	101	GASTROENTERITIS	.	
1939	7	FALLSBURG	HOTEL	20	GASTROENTERITIS	.	
1939	8	FALLSBURG	BOARDING HOUSE	24	GASTROENTERITIS	.	
1939	7	FALLSBURG	BOARDING HOUSE	25	GASTROENTERITIS	.	
1939	3	FORESTVILLE VILLAGE		60	GASTROENTERITIS	.	
1939	9	HIGHLANDS	SCHOOL	30	GASTROENTERITIS	.	
1939	7	ROCKLAND	BOARDING HOUSE	28	GASTROENTERITIS	.	
1939	3	ROMULUS VILLAGE	RESTAURANT	39	GASTROENTERITIS	.	
1939	7	SHANDAKAN	BOARDING HOUSE	21	GASTROENTERITIS	.	
1939	7	THOMPSON	BOARDING HOUSE	6	GASTROENTERITIS	.	
1939	7	THOMPSON	HOTEL	20	GASTROENTERITIS	.	
1939	7	THOMPSON	BOARDING HOUSE	5	GASTROENTERITIS	.	
1939	7	THOMPSON	BOARDING HOUSE	10	GASTROENTERITIS	.	
1939	7	WAWARSING	BOARDING HOUSE	36	GASTROENTERITIS	.	
1940	8	BETHEL	HOTELS	122	GASTROENTERITIS	.	
1940	7	CAIRO	HOTEL	19	GASTROENTERITIS	.	
1940	5	CANASTOTA		448	GASTROENTERITIS	.	
1940	8	CHENANGO		109	GASTROENTERITIS	.	
1940	7	CHILI	TRAILER	13	GASTROENTERITIS	.	
1940	11	CLYMER	SCHOOL	60	GASTROENTERITIS	.	
1940	7	COXSACKIE	CAMP	110	SHIGELLA SONNEI	.	
1940	5	FALLSBURG	HOTEL	35	GASTROENTERITIS	.	
1940	7	FALLSBURG	HOTEL	31	GASTROENTERITIS	.	
1940	7	HAGUE	HOTEL	7	GASTROENTERITIS	.	
1940	8	LIBERTY	ROOMING HOUSE	15	GASTROENTERITIS	.	
1940	10	MAYVILLE		190	GASTROENTERITIS	.	
1940	7	MILO	CAMP	37	GASTROENTERITIS	.	
1940	11	POUGHKEEPSIE		8	GASTROENTERITIS	.	
1940	12	ROCHESTER		35000	GASTROENTERITIS	.	
1940	6	ROCHESTER	ROOMING HOUSE	31	GASTROENTERITIS	6	TYPHOID
1940	2	SENECA FALLS		390	GASTROENTERITIS	.	
1940	6	THOMPSON	ROOMING HOUSE	29	GASTROENTERITIS	.	
1940	7	THOMPSON	ROOMING HOUSE	21	GASTROENTERITIS	.	
1940	7	THOMPSON	ROOMING HOUSE	29	GASTROENTERITIS	.	
1941	7	BERLIN		15	GASTROENTERITIS	.	
1941	7	BERNE	PICNIC	33	GASTROENTERITIS	.	
1941	7	ELLENBURG		22	GASTROENTERITIS	.	
1941	9	LIVONIA		34	SHIGELLA FLEXNERI	.	
1941	8	LODI		5	TYPHOID	.	
1941	7	MAMAKATING	BOARDING HOUSE	10	GASTROENTERITIS	.	
1941	7	NEW PALTZ	BOARDING HOUSE	7	GASTROENTERITIS	.	
1941	8	NEW PALTZ	BOARDING HOUSE	4	GASTROENTERITIS	.	
1941	7	NORTH ELBA	HOTEL	100	GASTROENTERITIS	.	
1941	8	POUGHKEEPSIE	FACTORY	27	GASTROENTERITIS	.	
1941	6	ROCHESTER	ROOMING HOUSE	30	GASTROENTERITIS	.	
1941	6	SANFORD	HOTEL	43	GASTROENTERITIS	.	
1941	7	SANFORD	SUMMER COTTAGE	14	GASTROENTERITIS	.	
1941	7	SAUGERTIES	HOTEL	11	GASTROENTERITIS	.	

NEW YORK

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY, DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1941	7	SAUGERTIES	CAMP	20	GASTROENTERITIS	.	
1941	8	SOLON		16	SHIGELLA FLEXNERI	.	
1941	7	WAWARSING	ROOMING HOUSE	18	GASTROENTERITIS	.	
1942	7	BETHEL	BOARDING HOUSE	20	GASTROENTERITIS	.	
1942	8	CAIRO	HOTEL	10	GASTROENTERITIS	.	
1942	8	CAIRO	BOARDING HOUSE	15	GASTROENTERITIS	.	
1942	7	COCHECTON	BOARDING HOUSE	18	GASTROENTERITIS	.	
1942	8	CORNWALL	HOTEL	30	GASTROENTERITIS	.	
1942	8	DEER PARK	BOARDING HOUSE	50	GASTROENTERITIS	.	
1942	7	ELLERY	PICNIC, PARK	141	GASTROENTERITIS	.	
1942	7	ESSEX CO.		50	GASTROENTERITIS	.	
1942	7	FALLSBURG	BOARDING HOUSE	40	GASTROENTERITIS	.	
1942	7	FALLSBURG	HOTEL	20	GASTROENTERITIS	.	
1942	8	FALLSBURG	HOTEL	35	GASTROENTERITIS	.	
1942	7	FALLSBURG	HOTEL	400	GASTROENTERITIS	.	
1942	7	FALLSBURG		6	GASTROENTERITIS	.	
1942	9	FORT EDWARD		10	TYPHOID	.	
1942	6	FRANKLIN CO.	INSTITUION	37	GASTROENTERITIS	.	
1942	6	HADLEY/LUZENE		200	GASTROENTERITIS	.	
1942	7	HIGHLAND	RESORT	119	GASTROENTERITIS	.	
1942	8	HURLEY	RESORT	6	TYPHOID	.	
1942	7	KIRKLAND	CAMP	14	GASTROENTERITIS	.	
1942	7	NASSAU	FACTORY	325	GASTROENTERITIS	.	
1942	8	NEW YORK		225	GASTROENTERITIS	.	
1942	6	ONEIDA CO.		5	TYPHOID	.	
1942	7	PUTNAM VALLEY	CAMP	19	GASTROENTERITIS	.	
1942	7	ROCKLAND	RESORT	50	GASTROENTERITIS	.	
1942	8	SENECA CO.		1000	GASTROENTERITIS	.	
1942	2	SIDNEY		2329	GASTROENTERITIS	.	
1942	7	THOMPSON	HOTEL	5	GASTROENTERITIS	.	
1942	8	WOODBURY	BOARDING HOUSE	6	GASTROENTERITIS	.	
1943	7	BETHEL	CAMP	13	GASTROENTERITIS	.	
1943	7	CAIRO		215	GASTROENTERITIS	.	
1943	7	CATSKILL	CAMP	30	GASTROENTERITIS	.	
1943	7	OTISVILLE		8	GASTROENTERITIS	.	
1943	7	ROCKLAND	HOTEL	150	GASTROENTERITIS	.	
1943	8	THOMPSON	CAMP	25	GASTROENTERITIS	.	
1944	7	BETHEL	CAMP	245	GASTROENTERITIS	.	
1944	7	BETHEL	HOTEL	20	GASTROENTERITIS	.	
1944	7	BETHEL	LODGING HOUSE	40	GASTROENTERITIS	.	
1944	7	BETHEL	BOARDING HOUSE	9	TYPHOID	.	
1944	8	BLOOMING GROVE	RESORT	50	GASTROENTERITIS	.	
1944	6	FALLSBURG	LODGING HOUSE	5	GASTROENTERITIS	.	
1944	7	FALLSBURG	LODGING HOUSE	40	GASTROENTERITIS	.	
1944	7	FALLSBURG		35	GASTROENTERITIS	.	
1944	7	FALLSBURG		25	GASTROENTERITIS	.	
1944	7	FALLSBURG		40	GASTROENTERITIS	.	
1944	7	FALLSBURG	HOTEL	17	GASTROENTERITIS	.	
1944	7	MAMAKATING		75	GASTROENTERITIS	.	
1944	7	MAMAKATING	LODGING HOUSE	60	GASTROENTERITIS	.	
1944	2	PORTLANDVILLE		2	TYPHOID	.	
1944	8	PROVIDENCE	CAMP	18	GASTROENTERITIS	.	
1944	1	THOMPSON	HOTEL	26	GASTROENTERITIS	.	
1944	7	THOMPSON	LODGING HOUSE	12	GASTROENTERITIS	.	
1944	7	THOMPSON	LODGING HOUSE	12	GASTROENTERITIS	.	

NEW YORK

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1944	7	THOMPSON	HOTEL	40	GASTROENTERITIS	.	
1945	7	BETHEL	HOTEL	8	GASTROENTERITIS	.	
1945	7	COMSTOCK		65	GASTROENTERITIS	.	
1945	7	DEER PARK	HOTEL	50	GASTROENTERITIS	.	
1945	9	ELLENBURG	SCHOOL	86	GASTROENTERITIS	.	
1945	5	ELLENVILLE		800	GASTROENTERITIS	.	
1945	7	FALLSBURG	HOTEL	42	GASTROENTERITIS	.	
1945	10	FT. COVINGTON	SCHOOL	60	GASTROENTERITIS	.	
1945	5	GENEVA CITY		4000	GASTROENTERITIS	.	
1945	4	GREENWICH		23	GASTROENTERITIS	.	
1945	4	IRVINGTON	FACTORY	14	GASTROENTERITIS	.	
1945	7	NEW YORK	FACTORY	30	CHEMICAL	.	
1945	6	PLATTSBURG	HOTEL	150	GASTROENTERITIS	.	
1945	9	POLAND VILLAGE	CAMP	7	TYPHOID	.	
1945	3	SALINA		4	TYPHOID	.	
1945	7	THOMPSON	HOTEL	20	GASTROENTERITIS	.	
1945	7	THOMPSON	HOTEL	20	GASTROENTERITIS	.	
1946	10	BERNE	SCHOOL	56	GASTROENTERITIS	.	
1946	7	CAIRO		18	GASTROENTERITIS	.	
1946	8	CLARENCE	CLUB	140	GASTROENTERITIS	.	
1946	7	COCHECTON	CAMP	100	GASTROENTERITIS	.	
1946	7	DEANSBORO		67	GASTROENTERITIS	.	
1946	7	DOVER	CAMP	150	GASTROENTERITIS	.	
1946	7	DOVER	CAMP	209	GASTROENTERITIS	.	
1946	7	DOVER	CAMP	40	GASTROENTERITIS	.	
1946	8	GENEVA	WORK CAMP	5	GASTROENTERITIS	.	
1946	7	INLET	HOTEL	27	GASTROENTERITIS	.	
1946	8	LEDYARD	WORK CAMP	5	GASTROENTERITIS	.	
1946	7	LOYD	CAMP	7	GASTROENTERITIS	.	
1946	8	PALENVILLE	HOTEL	29	GASTROENTERITIS	.	
1946	6	PLATTEKILL		8	GASTROENTERITIS	.	
1946	7	PLATTEKILL	BOARDING HOUSE	50	GASTROENTERITIS	.	
1946	8	SAUGERTIES	CAMP	41	GASTROENTERITIS	.	
1946	7	SHADAKEN	RESORT	50	GASTROENTERITIS	.	
1946	8	TANNERSVILLE		162	GASTROENTERITIS	.	
1946	8	THOMPSON	HOTEL	11	GASTROENTERITIS	.	
1946	6	WAWARSING	CAMP	39	GASTROENTERITIS	.	
1946	10	WEST HEMPSTEAD		67	GASTROENTERITIS	.	
1946	9	WESTERLOO	INN	18	GASTROENTERITIS	.	
1946	3	WESTPORT		150	GASTROENTERITIS	.	
1946	5	WESTPORT		100	GASTROENTERITIS	.	
1947	7	BETHEL	HOTEL	40	GASTROENTERITIS	.	
1947	7	CLARKSTOWN	LODGING HOUSE	20	GASTROENTERITIS	.	
1947	3	DANNEMORA	PRISON CAMP	16	GASTROENTERITIS	.	
1947	7	DURHAM		200	GASTROENTERITIS	.	
1947	7	ESOPUS	LODGE	32	GASTROENTERITIS	.	
1947	1	INDIAN LAKE	WORK CAMP	9	GASTROENTERITIS	.	
1947	10	KINDERHOOK	HOTEL	21	GASTROENTERITIS	.	
1947	7	MONTICELLO	COTTAGES	12	GASTROENTERITIS	.	
1947	7	NORTHAMPTON	RESORT	75	GASTROENTERITIS	.	
1947	9	OSWEGATCHIE	INN	12	GASTROENTERITIS	.	
1947	7	ROCHESTER	COTTAGES	43	GASTROENTERITIS	.	
1947	12	SUFFERN	WELFARE HOUSE	12	GASTROENTERITIS	.	
1947	7	THOMPSON	HOTEL	30	GASTROENTERITIS	.	
1947	7	THOMPSONVILLE	LODGE	12	GASTROENTERITIS	.	

NEW YORK

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1947	7	WAWARSING	RESORT	41	GASTROENTERITIS	.	
1948	10	AMSTERDAM		6	TYPHOID	.	
1948	7	BRANT	WORK CAMP	175	GASTROENTERITIS	.	
1948	8	CANTON	INN	18	GASTROENTERITIS	.	
1948	8	DUTCHESS CO.	CAMP	29	GASTROENTERITIS	.	
1948	7	MONTICELLO	HOTEL	15	GASTROENTERITIS	.	
1948	7	PHILLIPSTOWN		10	GASTROENTERITIS	.	
1948	7	ROCHESTER	ROOMING HOUSE	17	GASTROENTERITIS	.	
1948	7	WAWARSING	BOARDING HOUSE	21	GASTROENTERITIS	.	
1949	7	DENNINGS POINT	FACTORY	25	GASTROENTERITIS	.	
1949	6	MAMAKATING	RESORT	26	GASTROENTERITIS	.	
1949	12	NEW PALTZ	SCHOOL	54	GASTROENTERITIS	.	
1949	10	NEW YORK	APT. HOUSE	31	SHIGELLA SONNEI	.	
1949	7	ULSTER CO.	CAMP	30	GASTROENTERITIS	.	
1950	6	BETHEL		19	GASTROENTERITIS	.	
1950	9	CLARENCE	SCHOOL	65	GASTROENTERITIS	.	
1950	7	HAMBURG	TRAILER PARK	18	GASTROENTERITIS	.	
1950	8	ONEONTA		5	GASTROENTERITIS	.	
1950	7	SULLIVAN CO.		2	GASTROENTERITIS	.	
1950	9	WURTSBORO		12	GASTROENTERITIS	.	
1951	5	CLEVELAND VILLAGE		300	GASTROENTERITIS	.	
1951	6	SOUTH WESTERLOO	INN	33	GASTROENTERITIS	.	
1951	7	SULLIVAN CO.	CAMP	70	GASTROENTERITIS	.	
1951	8	WRIGHT		7	GASTROENTERITIS	.	
1952	7	CLINTON	CAMP	19	GASTROENTERITIS	.	
1952	7	ELIZAVILLE	CAMP	65	GASTROENTERITIS	.	
1952	6	GALWAY	SCHOOL	27	GASTROENTERITIS	.	
1952	.	LLOYD	INN	22	GASTROENTERITIS	.	
1952	7	RENSSELAER CITY		7	TYPHOID	.	
1952	4	RICHFORD	RESTAURANT	56	TYPHOID	.	
1952	10	WAWAYANDA	SCHOOL	19	GASTROENTERITIS	.	
1953	8	FLOYD	LODGE	19	GASTROENTERITIS	.	
1954	8	TOMPKINS CO.	CAMP	50	GASTROENTERITIS	.	
1954	8	USLTER CO.	CAMP	2	GASTROENTERITIS	.	
1956	11	NEWFIELD		6	SALMONELLA	.	
1956	11	RHINEBECK		83	HEPATITIS A VIRUS	.	
1957	2	CLINTON	FACTORY	2	TYPHOID	.	
1958	4	GLENS FALLS		11	SALMONELLA	.	
1959	.	SILVER LAKE	RESORT	4	TYPHOID	.	
1960	6	BATH		45	GASTROENTERITIS	.	
1960	9	PALISADES PARK	PARK	21	HEPATITIS A VIRUS	.	
1960	12	RAVENA		1400	SHIGELLA SONNEI	.	
1960	6	WILLIAMSVILLE		45	SHIGELLA SONNEI	.	
1963	7			12	GASTROENTERITIS	.	
1964	3			110	GASTROENTERITIS	.	
1964	4	NASSAU CO	COUNTRY CLUB	11	CHROMIUM	.	
1968	3	ANGOLA		184	GASTROENTERITIS	.	
1970	5	VOORHEESVILLE		1500	GASTROENTERITIS	.	
1971	11		RESTAURANT	750	GASTROENTERITIS	.	
1972	3		RESTAURANT	21	GASTROENTERITIS	.	
1974	9	NEW YORK	OFFICE	20	CHROMIUM	.	
1974	11	ROME		4800	GIARDIA	.	
1976	3	SUFFOLK CO.	CATERING FACILITY	750	SALMONELLA	.	
1978	9	ELLINGTON	RESTAURANT	11	GASTROENTERITIS	.	
1978	9	GOLDEN LAKE	CAMP	3	GASTROENTERITIS	.	

NEW YORK

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1978	10	SARANAC	CAMP	5	GASTROENTERITIS	.	
1978	5	SMYRNA SCHOOL	SCHOOL	23	SHIGELLA	.	
1978	11	TANNERSVILLE		130	GIARDIA	.	
1978	7	THERESA	CAMP	55	GASTROENTERITIS	.	
1980	8	BINGINGTON	CAMP	42	VIRAL GASTROENTERITI	.	

NORTH CAROLINA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY, DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1926	6	MILL VILLAGE		37	TYPHOID	.	
1933	3	BANNERS ELK		40	TYPHOID	.	
1938	12	WEST HILLSBORO		8	TYPHOID	.	
1941	5	BURGAW		8	TYPHOID	.	
1941	10	HIGH POINT		40	GASTROENTERITIS	.	
1944	1	FOREST CITY		500	TYPHOID	.	
1944	6	LOUISBURG		75	TYPHOID	.	
1949	11	MARION		5	GASTROENTERITIS	.	
1950	6		CAMP	75	GASTROENTERITIS	.	
1959	9	GOLDSBORO	SCHOOL	466	GASTROENTERITIS	.	
1963	10			221	SHIGELLA FLEXNERI	.	
1964	10			17	SHIGELLA FLEXNERI	.	
1969	8	THOMASVILLE		7	HEPATITIS A VIRUS	.	
1970	6	MECKLENBURG CO.		505	SHIGELLA	.	
1970	6	FOXBORO		27	SHIGELLA FLEXNERI	.	
1971	9	CAMP LEJEUNE	TRAILER PARK	38	GASTROENTERITIS	.	
1971	9	GASTON CO.		2	HEPATITIS A VIRUS	.	
1971	7	VERNON	CABINS	22	HEPATITIS A VIRUS	.	
1972	8	ASHEBORO	CAMP	9	GASTROENTERITIS	.	
1974	4	STANLY CO.	SCHOOL	213		.	
1979	10	BREVARD	CAMP	145	VIRAL GASTROENTERITI	.	
1979	3	SPEEDWELL ACRES	SUBDIVISION	35	GASTROENTERITIS	.	

NORTH DAKOTA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1923	4	FAIRMOUNT		47	TYPHOID	.	
1928	1	GRAND FORKS		300	GASTROENTERITIS	.	
1928	12	HANKINSON	CHURCH	7	TYPHOID	.	
1928	10	REEDER	SCHOOL	16	TYPHOID	.	
1929	7	GRAND FORKS		500	GASTROENTERITIS	.	
1931	6		INDIAN RESERVATION	28	TYPHOID	.	
1931	3	FORDVILLE		5	TYPHOID	.	
1931	9	SANBORN		14	TYPHOID	.	
1934	8	BISMARCK		10	TYPHOID	.	
1934	7	GRAND FORKS		350	GASTROENTERITIS	.	
1935	8	HATTAN		8	TYPHOID	.	
1935	5	NELSON CO.		6	TYPHOID	.	
1943	8	BALDWIN		7	PARATYPHOID	.	
1950	2	GRAND FORKS		9	LEPTOSPIRA	.	
1961	9	ST. JOHN		36	HEPATITIS A VIRUS	.	
1977	8	JAMESTOWN	HOTEL	25	GASTROENTERITIS	.	

OHIO

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1920	.	EAST LIVERPOOL		250	TYPHOID	.	
1920	8	SALEM		884	TYPHOID	7000	GASTROENTERITIS
1921	9	DELAWARE		10	TYPHOID	373	GASTROENTERITIS
1921	.	EAST LIVERPOOL		300	TYPHOID	.	
1921	1	HILLSBORO		12	TYPHOID	2000	GASTROENTERITIS
1921	5	WELLSVILLE		30	TYPHOID	.	
1927	3	NEW RICHMOND		7	TYPHOID	.	
1928	8	SPRINGFIELD	FOUNDRY	37	TYPHOID	.	
1930	8	JACKSON CO.		54	TYPHOID	.	
1933	8	MINGO JCT.	SPRING	10	TYPHOID	.	
1934	8	CALDWELL	PICNIC	10	TYPHOID	.	
1935	8	CAMBRIDGE		28	TYPHOID	.	
1936	3	MANSFIELD		148	TYPHOID	.	
1938	7	HARRISONVILLE		3	TYPHOID	.	
1939	7	MARION		3	TYPHOID	.	
1941	5	BETHEL		3	TYPHOID	.	
1941	8	JASPER MILLS		2	TYPHOID	.	
1941	8	LONDON		15	TYPHOID	.	
1941	7	MUSKINGUM CO.		6	TYPHOID	.	
1941	2	NAVARRE		500	GASTROENTERITIS	.	
194[illegible]	7	NEWTON FALLS		5	TYPHOID	.	
1941	7	PORTLAND		4	TYPHOID	.	
1942	3	ST. MARY'S		2000	GASTROENTERITIS	.	
1943	6	MIAMI CO.		2	TYPHOID	.	
1943	6	THORNVILLE		7	TYPHOID	.	
1944	6	GUYSVILLE		3	TYPHOID	.	
1949	1	LOUDONVILLE		1000	GASTROENTERITIS	.	
1953	.	LICKING CO.		9	TYPHOID	.	
1954	1	ROCK SPRINGS		2	TYPHOID	.	
1956	.			700	GASTROENTERITIS	.	
1957	4	UPPER ARLINGTON		3	TYPHOID	.	
1959	1	ASHTABULA CO.	POWER PLANT	57	GASTROENTERITIS	.	
1959	7	BRACEVILLE		8	TYPHOID	.	
1960	8	LAKE HOPE	PARK	98	GASTROENTERITIS	.	
1960	3	MIDDLEPORT-POMEROY		122	GASTROENTERITIS	.	
1961	7	OTTAWA CO.	CAMP	37	GASTROENTERITIS	.	
1961	9	PORTAGE CO.	INN	54	GASTROENTERITIS	.	
1963	11	CINCINNATI		21	HEPATITIS A VIRUS	.	
1963	7	DAYTON	HOSPITAL	100	SALMONELLA	.	
1963	4	FRANKLIN CO.		5	TYPHOID	.	
1967	8	CINCINNATI		4	GASTROENTERITIS	.	
1972	5	SHELBY CO.	TRAILER PARK	9	HEPATITIS A VIRUS	.	
1972	7	SUMMIT CO.		12	HEPATITIS A VIRUS	.	
1973	7	SHERRODSVILLE	PARK	35	HEPATITIS A VIRUS	.	
1974	7	BLUE ROCK STATE PARK	PARK	6	SHIGELLA	.	
1975	6	CANTON	MOTEL	140	GASTROENTERITIS	.	
1980	8		HIKERS	10	GASTROENTERITIS	.	
1980	8	CHAUNCEY VILLAGE		738	GASTROENTERITIS	.	
1980	7	OXFORD	PARK	28	GASTROENTERITIS	.	
1980	8	SOUTH BASS ISLAND	CAMP	25	GASTROENTERITIS	.	

OKLAHOMA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1926	3	ADA	PLANT	36	TYPHOID	.	
1943	8	ARDMORE		3	TYPHOID	.	
1943	7	QUINTON		7	TYPHOID	.	
1944	4	OKLAHOMA	SCHOOL	37	GASTROENTERITIS	.	
1950	9	TULSA		8	GASTROENTERITIS	1	TYPHOID
1951	1	STERLING		200	SHIGELLA	.	
1967	12	ALTUS		30	HEPATITIS A VIRUS	.	
1967	9	WELEETKA		5	E. HISTOLYTICA	.	
1968	8	INDIAN SCHOOL	SCHOOL	19	SHIGELLA FLEXNERI	.	
1968	1	TALIHINA		10	HEPATITIS A VIRUS	.	
1971	11	LOCUST GROVE		50	HEPATITIS A VIRUS	.	
1971	8	OKLAHOMA CITY		6	HEPATITIS A VIRUS	.	
1976	4	SEMINOLE	SCHOOL	65	GASTROENTERITIS	.	

OREGON

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1927	5			16	TYPHOID	.	
1927	2		PLANT	9	TYPHOID	.	
1928	7			59	GASTROENTERITIS	.	
1943	10	PORTLAND	SHIP YARD	1179	GASTROENTERITIS	.	
1945	1	KLAMATH CO.	LUMBER MILL	75	GASTROENTERITIS	.	
1944	5	CARVER	CAMP	20	GASTROENTERITIS	.	
1949	10	GLIDE	SCHOOL	125	HEPATITIS A VIRUS	.	
1949	7	WILLAMETTE	RESTAURANT	6	HEPATITIS A VIRUS	.	
1950	6	COQUILLE		250	GASTROENTERITIS	.	
1950	8	LANE CO.		8	HEPATITIS A VIRUS	.	
1953	8	BREITENBUSH	RESORT	38	SHIGELLA SONNEI	.	
1958	2	KLAMATCH CO.		2		.	
1960	5	MILTON-FREEWATER		6	TYPHOID	.	
1961	1		INSTITUTION	47	HEPATITIS A VIRUS	.	
1961	8	MARION COUNTY	BOWLING ALLEY	44	HEPATITIS A VIRUS	.	
1961	12	WARM SPRINGS RESERV.	INDIAN RESERV.	186	SHIGELLA	.	
1966	5		DAIRY RANCH	3	SALMONELLA	.	
1966	1	CURRY CO.		77	HEPATITIS A VIRUS	.	
1966	4	HOOD RIVER	RESTAURANT	155	GASTROENTERITIS	.	
1968	7	LINCOLN CITY	CAMP	658	GASTROENTERITIS	.	
1968	4	MADRAS		96	GASTROENTERITIS	.	
1969	5	JEFFERSON CO.	SCHOOL	24	GASTROENTERITIS	.	
1969	3	PRINEVILLE	SUBDIVISION	31	SHIGELLA SONNEI	.	
1971	6		RESTAURANT	200	GASTROENTERITIS	.	
1972	5	TROY		37	GASTROENTERITIS	.	
1973	7	TROY		29	GASTROENTERITIS	.	
1974	2	BEAVERTON		18	OIL	.	
1974	8	COLUMBIA CITY		400	GASTROENTERITIS	.	
1974	8	WHEELER HTS.		19	GASTROENTERITIS	.	
1975	9			7	GASTROENTERITIS	.	
1975	6	CRATER LAKE	PARK	1000	TOXIGENIC E. COLI	.	
1978	5	ALBANY		34	SHIGELLA SONNEI	.	
1978	7	NESKOWIN		174	GASTROENTERITIS	.	
1979	7	COLTON		300	GASTROENTERITIS	.	
1979	12	GOVERNMENT CAMP		120	GIARDIA	.	
1979	10	LINCOLN CITY		1200	GASTROENTERITIS	.	
1979	12	RIVERVIEW HEIGHTS		120	GASTROENTERITIS	.	
1979	10	ZIGZAG		21	GIARDIA	.	
1980	6	ROCKAWAY		63	GIARDIA	.	

PENNSYLVANIA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1921	.			500	GASTROENTERITIS	.	
1921	.			26	GASTROENTERITIS	.	
1921	.			24	TYPHOID	.	
1921	.			48	TYPHOID	.	
1922	.			53	TYPHOID	.	
1922	.			200	GASTROENTERITIS	.	
1923	.			24	TYPHOID	.	
1923	.			12	TYPHOID	.	
1923	.			19	TYPHOID	.	
1923	.			30	TYPHOID	.	
1924	.			28	TYPHOID	.	
1924	.			14	TYPHOID	.	
1925	.			90	TYPHOID	.	
1925	.			8	TYPHOID	.	
1926	.			37	TYPHOID	.	
1926	.			25	TYPHOID	.	
1926	.			36	TYPHOID	.	
1926	.			38	TYPHOID	.	
1926	.			47	TYPHOID	.	
1926	.			20	TYPHOID	.	
1927	.			15	TYPHOID	.	
1928	.			14	TYPHOID	.	
1928	.			28	TYPHOID	.	
1930	7	CHESTER		10	TYPHOID	.	
1930	12	CRAWFORD CO.	SCHOOL	8	TYPHOID	.	
1930	8	EAST DEER TWP.		8	TYPHOID	.	
1930	8	HAMPTON TWP.		16	TYPHOID	.	
1930	9	HARRISON TWP.		8	TYPHOID	.	
1930	7	LANCASTER TWP.		16	TYPHOID	.	
1930	4	MUIR		10	TYPHOID	.	
1930	7	NEW CASTLE		22	TYPHOID	.	
1930	8	PERRY TWP.		19	TYPHOID	.	
1930	8	WRIGHTSVILLE		12	TYPHOID	.	
1931	3	BROOKVILLE	DAIRY	10	TYPHOID	.	
1931	9	ROBERTSDALE		21	TYPHOID	.	
1931	11	SNOW SHOE TWP.		12	TYPHOID	.	
1931	3	SYKESVILLE	RESTAURANT	9	TYPHOID	.	
1932	8	BEAVER FALLS		5	TYPHOID	.	
1932	7	LOGAN TWP.		48	TYPHOID	.	
1932	9	SHARON		8	TYPHOID	.	
1933	11	ALIQUIPPA		18	TYPHOID	.	
1933	9	GERMAN TWP.		17	TYPHOID	.	
1933	8	LEHMAN TWP.		16	TYPHOID	.	
1933	9	MONESSEN		7	TYPHOID	.	
1934	12	AVELLA		9	TYPHOID	.	
1934	1	BROAD TOP TWP.		24	TYPHOID	.	
1934	3	FARRELL		17	TYPHOID	.	
1935	12	EVERETT		6	TYPHOID	.	
1935	2	HARRISON TWP.		6	TYPHOID	.	
1935	1	MENALLEN TWP.		7	TYPHOID	.	
1936	1	ALLENTOWN		5	TYPHOID	.	
1936	11	CECIL		20	TYPHOID	.	
1936	9	EDNA		18	TYPHOID	.	
				6	TYPHOID	.	

PENNSYLVANIA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1936	9	ELDERVILLE		13	TYPHOID	.	
1936	2	ERNEST		6	TYPHOID	.	
1936	7	LAURELVILLE	HOTEL	5	TYPHOID	.	
1936	12	MORRISVILLE		1000	GASTROENTERITIS	.	
1936	7	READING	BAKERY	16	TYPHOID	.	
1936	8	RURAL		42	TYPHOID	.	
1941	7	CAMP CANADENSIS		101	GASTROENTERITIS	.	
1941	7	FRENCHVILLE		12	SHIGELLA	.	
1941	9	POTTERSDALE		11	SHIGELLA	.	
1941	8	RICHMOND		12	SALMONELLA	.	
1942	7	PITTSBURGH	FACTORY	250	GASTROENTERITIS	.	
1943	8	MORTOWN		20	TYPHOID	.	
1943	6	MT. MORRIS		17	TYPHOID	.	
1948	2			9	HEPATITIS A VIRUS	.	
1950	12	MERCERSBURG		200	GASTROENTERITIS	.	
1953	12	MERCERSBURG	SCHOOL	25	HEPATITIS A VIRUS	.	
1956	3	CURWENSVILLE		189	HEPATITIS A VIRUS	.	
1964	5			5	TYPHOID	.	
1966	6	WASHINGTON CROSSING	PARK	454	GASTROENTERITIS	.	
1967	10	PHILADELPHIA		160	SHIGELLA SONNEI	.	
1972	6		SCHOOL	150		.	
1972	7	REFFS	CAMP	5	HEPATITIS A VIRUS	.	
1973	8	BUCKS CO.	COUNTRY CLUB	101	SHIGELLA SONNEI	.	
1973	6	CARLISLE	HOTEL	38	GASTROENTERITIS	.	
1973	6	CARLISLE	HOTEL	71	GASTROENTERITIS	.	
1973	12	CLARION CO.	RESTAURANT	145	GASTROENTERITIS	.	
1973	8	KUTZTOWN	RESTAURANT	24	GASTROENTERITIS	.	
1973	9	MILROY	CHURCH	153	GASTROENTERITIS	.	
1974	6	ALLENTOWN		12	GASTROENTERITIS	.	
1974	7	KUTZTOWN	RESTAURANT	72	GASTROENTERITIS	.	
1974	8	LAKE COMO	CAMP	600	SHIGELLA SONNEI	.	
1974	10	LEACOCK TWP.	RESTAURANT	18	GASTROENTERITIS	.	
1975	7	LIBERTY TWP.	CAMP	88	GASTROENTERITIS	.	
1975	8	MONROE CO.	RESTAURANT	37	GASTROENTERITIS	.	
1975	8	SEWICKLEY		5000	GASTROENTERITIS	.	
1975	10	WAYNE TWP.	FIRE HALL	100	GASTROENTERITIS	.	
1976	4	BERKS CO.	RECREATION AREA	4	GASTROENTERITIS	.	
1976	6	BERKS CO.	SCHOOL	26	GASTROENTERITIS	.	
1976	11	BERKS CO.	RESTAURANT	66	GASTROENTERITIS	.	
1976	10	BUCKS CO.		24	GASTROENTERITIS	.	
1976	6	CENTRE CO.	CAMP	34	GASTROENTERITIS	.	
1976	7	LANCASTER CO.	RESTAURANT	10	GASTROENTERITIS	.	
1976	7	LANCASTER CO.	RESTAURANT	150	GASTROENTERITIS	.	
1976	7	LANCASTER CO.	RESTAURANT	18	GASTROENTERITIS	.	
1976	8	LANCASTER CO.	RESTAURANT	10	GASTROENTERITIS	.	
1976	4	LEBANON CO.	COUNTRY CLUB	30	GASTROENTERITIS	.	
1976	5	LEBANON CO.	COUNTRY CLUB	35	GASTROENTERITIS	.	
1976	6	SULLIVAN CO.	RECREATION AREA	10	GASTROENTERITIS	.	
1976	6	SULLIVAN CO.	RECREATION AREA	5	GASTROENTERITIS	.	
1976	4	SUSQUEHANNA CO.		2	LEAD	.	
1977	11	BERKS CO.	SCHOOL	11	COPPER	.	
1977	1	BUCKS CO.		10	GASOLINE	.	
1977	1	CARLISLE		17	SHIGELLA SONNEI	.	
1977	5	CHESTER CO.	RESTAURANT	30	GASTROENTERITIS	.	
1977	5	CUMBERLAND CO.	RESTAURANT	500	GASTROENTERITIS	.	

PENNSYLVANIA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1977	10	CUMBERLAND CO.	CAMP	45	GASTROENTERITIS	.	
1977	1	MERCER CO.	RESTAURANT	73	GASTROENTERITIS	.	
1977	8	MONROE CO.	CAMP	150	GASTROENTERITIS	.	
1977	7	MONTGOMERY CO.	CAMP	15	GASTROENTERITIS	.	
1977	7	SCHUYLKILL CO.	CAMP	47	GASTROENTERITIS	.	
1978	8	CATAWISSA	CAMP	63	GASTROENTERITIS	.	
1978	5	DINGMANS FERRY	CAMP	350	VIRAL GASTROENTERITI	.	
1978	4	FRANKLIN TWP.	CAMP	50	GASTROENTERITIS	.	
1978	7	MONROE CO.	CAMP	120	VIRAL GASTROENTERITI	.	
1978	6	HAWAKAWA CAMP	CAMP	99	SHIGELLA SONNEI	.	
1978	11	VILLANOVA	SCHOOL	200	GASTROENTERITIS	.	
1978	2	YORK CO.	RESORT	91	GASTROENTERITIS	.	
1979	9	BRADFORD		3500	GIARDIA	.	
1979	7	CLEARFIELD CO.	RESTAURANT	165	GASTROENTERITIS	.	
1979	10	CUMBERLAND CO.	RESTAURANT	135	GASTROENTERITIS	.	
1979	3	DAUPHIN CO.		12	GASTROENTERITIS	.	
1979	8	DAUPHIN CO.	TRAILER PARK	43	GASTROENTERITIS	.	
1979	9	WASHINGTON CO.	SUBDIVISION	35	GASTROENTERITIS	.	
1979	7	WAYNE CO.	CAMP	151	VIRAL GASTROENTERITI	.	
1980	4			12	GASTROENTERITIS	.	
1980	7		SUBDIVISION	90	GASTROENTERITIS	.	
1980	12			1	COPPER	.	
1980	3	BEDFORD	APARTMENT	15	GIARDIA	.	
1980	7	CARLISLE	RESTAURANT	55	VIRAL GASTROENTERITI	.	
1980	8	DALLAS	CAMP	139	GASTROENTERITIS	.	
1980	1	KINGSTON		3	GASTROENTERITIS	.	
1980	8	LANCASTER CO	WELDING SHOP	48	HEPATITIS A VIRUS	.	
1980	11	PITTSBURGH		20	CHLORADANE	.	
1980	12	PITTSBURGH		2000	CHLORADANE	.	

PUERTO RICO

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY; DISEASE
1941	11	JUANA DIAZ		13	TYPHOID	.	
1943	7	PENUELAS		42	TYPHOID	.	
1945	1	PONCE		26	TYPHOID	.	
1946	12	SAN LORENZO		2265	SHIGELLA FLEXNERI	.	
1948	11	COMERIO		81	TYPHOID	.	
1949	12	PATILLES		26	TYPHOID	.	
1956	8	PONCE		23	TYPHOID	.	
1975	3	SABANA		550	GASTROENTERITIS	.	
1976	7	COMERIO		2150	SHIGELLA SONNEI	.	

RHODE ISLAND

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1926	5	TIVERTON		15	TYPHOID	.	
1980	9	FORESTDALE		20	TCE	.	

SOUTH CAROLINA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY; DISEASE
1935	2	GOLDVILLE		17	TYPHOID	.	
1935	6	LEXINGTON CO.	SAWMILL	15	TYPHOID	.	
1938	5	ELLENTON		23	TYPHOID	.	
1941	1	NORTH CHARLESTON		35	TYPHOID	.	
1942	12	LANCASTER		28	TYPHOID	.	
1946	4	CHESTER		24	TYPHOID	.	
1966	6	COLUMIBA		9	E. HISTOLYTICA	.	
1969	9	SUMTER	CAMP	14	HEPATITIS A VIRUS	.	
1975	10	LANGLEY		7	ETHYL ACHALATE	.	
1977	7		FACTORY	47	HEPATITIS A VIRUS	.	
1978	9	WEST COLUMBIA	TRAILER PARK	78	SALMONELLA	.	
1979	12	DUTCHMAN SHORES	SUBDIVISION	104	GASTROENTERITIS	.	
1980	7	COLUMBIA	TRAILER PARK	106	GASTROENTERITIS	.	

SOUTH DAKOTA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1922	8	DEADWOOD		4	TYPHOID	.	
1922	9	INSTITUTION	INSTITUTION	17	TYPHOID	.	
1925	1	CHAMBERLAIN		8	TYPHOID	.	
1925	2	WHITE RIVER		8	TYPHOID	.	
1925	3	WHITE RIVER		6	TYPHOID	.	
1925	8	WHITE RIVER		13	TYPHOID	.	
1933	1	CHAMBERLAIN		282	TYPHOID	.	
1950	.	BEADLE CO.		11	TYPHOID	.	
1951	9	SIOUX FALLS	SUBDIVISION	18	GASTROENTERITIS	.	
1955	10	STANDING ROCK RESERV.	INDIAN RESERV.	7	TYPHOID	.	
1962	6			19	SHIGELLA	.	
1979	7	RAPID CITY		16	OIL	.	

TENNESSEE

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1925	1	NEW PROVIDENCE	LODGE	18	TYPHOID	.	
1927	1	LOUDON		15	TYPHOID	.	
1928	1			14	TYPHOID	300	GASTROENTERITIS
1934	10	TAZEWELL		100	GASTROENTERITIS	.	
1936	7	SWEETWATER		700	GASTROENTERITIS	.	
1945	7	TAZEWELL		100	TYPHOID	.	
1952	7		CAMP	122	GASTROENTERITIS	.	
1952	7		CAMP	104	HEPATITIS A VIRUS	.	
1954	5	COWAN		180	GASTROENTERITIS	.	
1959	12	HAWKINS CO.		10	HEPATITIS A VIRUS	.	
1969	2	RIPLEY		3	PESTICIDE	.	
1972	9	FRANKLIN	SCHOOL	19	GASTROENTERITIS	.	
1973	8		FARM	5	GIARDIA	.	
1975	7	CENTERVILLE	CAMP	40	GASTROENTERITIS	.	
1976	3	CHATTANOOGA		13	CHLORADANE	.	
1978	6	GREENBRIER	WORK CREW	5	GASTROENTERITIS	.	
1980	8	MURFREESBORO		5	GASTROENTERITIS	.	

TEXAS

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY, DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1929	9	JUNCTION		25	TYPHOID	.	
1929	9	RICHLAND SPRINGS		67	TYPHOID	.	
1934	10	BORGER		40	GASTROENTERITIS	.	
1934	.	CURRY		12	TYPHOID	.	
1934	.	JEFFERSON		7	TYPHOID	.	
1934	.	LINDALE		7	TYPHOID	.	
1934	1	ST. JO		12	TYPHOID	.	
1934	.	WHITE OAK		12	TYPHOID	.	
1935	.	FORT WORTH		20	GASTROENTERITIS	.	
1935	.	LAWN		5	TYPHOID	.	
1936	9	GEORGETOWN		16	TYPHOID	.	
1938	6	BONHAM		4	TYPHOID	.	
1938	4	FREER		20	GASTROENTERITIS	2	TYPHOID
1938	1	GANADO		5	TYPHOID	.	
1939	4	TAYLOR		150	SHIGELLA FLEXNERI	.	
1940	9	FREER		3	TYPHOID	.	
1940	7	IRENE		4	E. HISTOLYTICA	.	
1940	12	SAN SABA		10	TYPHOID	.	
1942	1	MEADOWBROOK		45	GASTROENTERITIS	.	
1944	3	BAY CITY		1000	GASTROENTERITIS	.	
1945	2	GREENS BAYOU	SHIP YARD	54	GASTROENTERITIS	.	
1948	5	SHELBY CO.	SCHOOL	32	TYPHOID	.	
1962	10	COLLIN CO.		5	ARSENIC	.	
1963	4	EDINBURG		9	PESTICIDE	.	
1963	7	RAYWOOD		6	TYPHOID	.	
1964	1			6	TYPHOID	.	
1969	10	VERNON		7	HEPATITIS A VIRUS	.	
1971	11	ST. LAWRENCE		3	HEPATITIS A VIRUS	.	
1977	5	HUBBARD		12	GASTROENTERITIS	.	
1980	6	GEORGETOWN		8000	GASTROENTERITIS	.	
1980	7	MARBLE FALLS		2550	GASTROENTERITIS	.	

UTAH

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY, DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1923	7	BRIGHAM		230	TYPHOID	.	
1924	9	SALT LAKE CITY		144	TYPHOID	.	
1929	6	OGDEN		19	TYPHOID	.	
1939	10	SALT LAKE CO.		10	TYPHOID	.	
1940	7	KAYSVILLE		117	TYPHOID	.	
1956	7	ROOSEVELT		800	SHIGELLA FLEXNERI	.	
1972	9	SAN JUAN	CAMP	60	GIARDIA	.	
1974	9		CAMPERS	34	GIARDIA	.	
1977	6	WASATCH CO.	RESORT	7	GIARDIA	.	
1978	7	PARK CITY	PICNICS	18	GIARDIA	.	
1980	6	KANE CO.	RESORT	105	GASTROENTERITIS	.	

VERMONT

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1924	9	NEWPORT		17	TYPHOID	.	
1934	4	WEBSTERVILLE		60	TYPHOID	.	
1934	1	WINOOSKI	MILL	13	TYPHOID	.	
1963	10	ISLAND POND		325	SALMONELLA	.	
1967	8		CAMP	140	SHIGELLA SONNEI	.	
1969	7	FAIRLEE	CAMP	38	SALMONELLA	.	
1969	7	FAIRLEE	CAMP	93	GASTROENTERITIS	.	
1969	7	SAXON'S RIVER	SCHOOL	35	GASTROENTERITIS	.	
1971	6	BRADFORD		3	GASTROENTERITIS	.	
1973	12	DANVILLE		20	GIARDIA	.	
1973	11	ESSEX CENTER		32	GIARDIA	.	
1976	2	MONTGOMERY CENTER		150	GASTROENTERITIS	.	
1977	3		RESTAURANT	74	COPPER	.	
1978	5	BENNINGTON		3000	CAMPYLOBACTER	.	
1979	7	RICHMOND	SUBDIVISION	17	GASTROENTERITIS	.	
1990	6	MANCHESTER		990	GASTROENTERITIS	.	
1980	9	SHAFTSBURY	SCHOOL	200		.	

VIRGINIA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1920	9	GRUNDY		7	TYPHOID	•	
1920	9	SOUTH CLINCHFIELD		8	TYPHOID	•	
1924	•	CLINCHBURG		61	TYPHOID	•	
1925	•	KENILWORTH		17	TYPHOID	•	
1926	10	TIMBERVILLE		54	TYPHOID	•	
1928	•	LURAY		19	TYPHOID	•	
1931	1	ALMAGRO		17	TYPHOID	10	GASTROENTERITIS
1932	2	TAZEWELL CO.		30	TYPHOID	•	
1938	5	HIGHTOWN		12	TYPHOID	•	
1938	7	WYTHEVILLE	FACTORY	129	GASTROENTERITIS	•	
1939	4	CASTLE RUN STREAM		20	TYPHOID	•	
1939	2	GLENWOOD		10	TYPHOID	•	
1939	10	HOLLINS	SCHOOL	81	SHIGELLA SONNEI	•	
1940	9	HOLLINS	SCHOOL	24	GASTROENTERITIS	•	
1941	11	AUGUSTA CO.	RESTAURANT	25	TYPHOID	•	
1941	9	BRISTOL		49	TYPHOID	•	
1941	11	WILLIAMSBURG	SCHOOL	13	SHIGELLA FLEXNERI	•	
1942	7	ELKTON	FACTORY	40	GASTROENTERITIS	•	
1942	6	FRONT ROYAL		167	GASTROENTERITIS	•	
1946	5	DUNBAR	COLLIERY	100	GASTROENTERITIS	•	
1947	9	BRISTOL		3500	GASTROENTERITIS	•	
1948	4	BISHOP		30	GASTROENTERITIS	•	
1949	1	HOLLINS	SCHOOL	58	GASTROENTERITIS	•	
1959	9	WINCHESTER		9	TYPHOID	•	
1964	6			75	GASTROENTERITIS	•	
1967	4	ARLIE CENTER	RESORT	64	TOXIGENIC E. COLI	•	
1969	4	MIDDLETOWN		6	PESTICIDE	•	
1979	10	ROANOKE		10	CHLORADANE	•	
1979	1	TEMPERANCEVILLE		8	ARSENIC	•	

WASHINGTON

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGI DISEASE
1923	10	CLAYTON		12	TYPHOID	.	
1923	7	EVERETT	MILL	86	TYPHOID	.	
1923	10	KELSO		33	TYPHOID	.	
1923	7	LEWIS CITY	LUMBERCAMP	7	TYPHOID	.	
1936	6	REDMOND	PICNIC	9	TYPHOID	.	
1936	4	SKAGIT CO.	FARM	14	TYPHOID	.	
1939	5	OLYMPIA		92	PAINT	.	
1943	8	OROVILLE		6	TYPHOID	.	
1943	4	SEATTLE	SHIP YARD	1911	GASTROENTERITIS	.	
1947	.	WENATCHEE	RESTAURANT	14	GASTROENTERITIS	.	
1952	12	VASHON ISLAND		100	HEPATITIS A VIRUS	.	
1959	7	KING CO.	RESORT	58	GASTROENTERITIS	.	
1965	8	CLEARWATER	LOGGING CAMP	125	GASTROENTERITIS	.	
1967	8	AMBOY		13	HEPATITIS A VIRUS	.	
1972	9	ROSLYN	RECREATION	3	SALMONELLA	.	
1972	6	YAKIMA		5	TYPHOID	.	
1974	6	DRYDEN		5	TYPHOID	.	
1976	5	CAMAS		600	GIARDIA	.	
1977	7	ISSAQUAH	HIKERS	12	GASTROENTERITIS	.	
1978	5	ARTONDALE SCHOOL	SCHOOL	467	VIRAL GASTROENTERITI	.	
1978	8	FORKS	CAMP	23	GIARDIA	.	
1979	7	BELLEVUE	CAMP	49	GASTROENTERITIS	.	
1980	4		BACK PACKERS	6	GIARDIA	.	
1980	1	BOISTFORT		79	GIARDIA	.	
1980	3	LEAVENWORTH		578	GIARDIA	.	
1980	9	LEAVENWORTH	CAMP	20	GIARDIA	.	
1980	9	PIERCE CO		46	GASTROENTERITIS	.	
1980	7	SUQUAMISH		23	GASTROENTERITIS	.	

WEST VIRGINIA

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1920	8	SPENCER		40	TYPHOID	.	
1921	4	ALDERSON		8	TYPHOID	.	
1921	1	PHILIPPI		24	TYPHOID	.	
1922	.	AFFINITY		48	TYPHOID	.	
1922	1	HINTON		10	TYPHOID	.	
1922	3	PARSONS		22	TYPHOID	.	
1924	7	WILLIAMSON		111	GASTROENTERITIS	.	
1927	12	BOOMER		16	TYPHOID	.	
1927	12	GRAFTON		125	TYPHOID	.	
1927	10	SUTTON		100	GASTROENTERITIS	.	
1928	5	PINE GROVE		6	TYPHOID	.	
1928	12	POWHATAN		25	TYPHOID	.	
1929	4	COALWOOD-CARETTA		85	TYPHOID	.	
1929	10	MARLINTON		16	TYPHOID	.	
1929	2	ROMNEY		16	TYPHOID	.	
1929	2	TAPLIN		30	TYPHOID	.	
1930	11	CHARLESTON		6500	GASTROENTERITIS	.	
1930	12	TERRA ALTA		35	TYPHOID	.	
1938	8	ELLAMORE		17	TYPHOID	.	
1938	7	WEST UNION		10	TYPHOID	.	
1939	4	BIG MOUNTAIN		8	TYPHOID	.	
1944	4			7	PARATYPHOID	.	
1948	8	LEWISBURG	CAMP	100	GASTROENTERITIS	.	
1949	.	GREENBRIER CO.	CAMP	15	GASTROENTERITIS	.	
1949	.	MCDOWELL CO.		22	GASTROENTERITIS	.	
1949	.	OHIO CO.		4	GASTROENTERITIS	.	
1954	2	KILLARNEY		9	TYPHOID	.	
1956	11	KEARNEYSVILLE		10	ARSENIC	.	
1960	5	CRAIGSVILLE	SCHOOL	53	HEPATITIS A VIRUS	.	
1967	9	MORGANTOWN		700	GASTROENTERITIS	.	
1972	11	CHEYLAN		60	GASTROENTERITIS	.	

WISCONSIN

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1920	9	NEENAH	FACTORY	19	TYPHOID	.	
1921	9	GREEN BAY	FACTORY	31	TYPHOID	.	
1921	9	MINOCQUA		10	TYPHOID	.	
1921	11	STURGEON BAY		21	TYPHOID	.	
1922	3	FOND DU LAC		12	TYPHOID	.	
1922	6	STURGEON BAY		31	TYPHOID	.	
1923	7	WAUSAU	FACTORY	7	TYPHOID	20	GASTROENTERITIS
1924	5	STURGEON BAY		20	TYPHOID	.	
1924	6	WAUSAU	FACTORY	4	TYPHOID	60	GASTROENTERITIS
1929	10	FOND DU LAC		50	TYPHOID	.	
1929	8	STURGEON BAY		70	TYPHOID	.	
1929	1	TWO RIVERS		20	TYPHOID	.	
1935	9	WOOD CO.		7	TYPHOID	.	
1938	2	MILWAUKEE		29250	GASTROENTERITIS	.	
1942	8	SUPERIOR	SHIP YARD	13	GASTROENTERITIS	.	
1961	10	MILWAUKEE		1	ANTIFREEZE	.	
1974	7	EAST TROY		17	PHENOL	.	
1979	7	BURLINGTON		4	SHIGELLA SONNEI	.	
1980	7		PLANT	12	GASTROENTERITIS	.	

WYOMING

YEAR	MONTH	LOCATION	REMARKS	CASES	ETIOLOGY; DISEASE	ADDITIONAL CASES	OTHER ETIOLOGY DISEASE
1939	7	HUNTLEY		8	TYPHOID	.	
1961	7	FREMONT CO.	TRAILER PARK	6	HEPATITIS A VIRUS	.	
1961	7	FT. WASHAKIE		4	HEPATITIS A VIRUS	.	
1961	3	MEETEESE		17	HEPATITIS A VIRUS	.	
1970	7	NATRONA CO.		150	SALMONELLA	.	
1977	7	YELLOWSTONE	PARK	402	GASTROENTERITIS	.	
1980	5		BACK PACKERS	21	CAMPYLOBACTER	.	